**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

| **INDUCTION PROGRAM (3 weeks duration)** |
|---|
| ❖ Physical activity |
| ❖ Creative Arts |
| ❖ Universal Human Values |
| ❖ Literary |
| ❖ Proficiency Modules |
| ❖ Lectures by Eminent People |
| ❖ Visits to local Areas |
| ❖ Familiarization to Dept./Branch & Innovations |

**I B.Tech – I Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | |
| 1 | BS | 19ABS9901 | Algebra and Calculus | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 2 | BS | 19ABS9902 | Applied Physics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | ES | 19AES0501 | Problem Solving and Programming | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 4 | HS | 19AHS9901 | Communicative English - I | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| **Practical** | | | | | | | | | | |
| 5 | WS | 19ALC0401 | Electronics and Communication Engineering Workshop | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 6 | BS | 19ABS9907 | Applied Physics Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | ES | 19AES0503 | Problem Solving and Programming Lab | 0 | 0 | 4 | 2 | 30 | 70 | 100 |
| 8 | HS | 19AHS9902 | Communicative English - I Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| **TOTAL** | | | | | | | **18.5** | **240** | **560** | **800** |

**I B. Tech – II Semester**

| S. No. | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | |
| 1 | ES | 19AES0201 | Network Theory | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | BS | 19ABS9906 | Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 3 | BS | 19ABS9904 | Chemistry | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 19AES0502 | Data Structures | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| **Practical** | | | | | | | | | | |
| 5 | WS | 19ALC0301 | Engineering Workshop Practice | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 6 | ES | 19AES0301 | Engineering Graphics Lab | 1 | 0 | 4 | 3 | 30 | 70 | 100 |
| 7 | ES | 19AES0203 | Network Theory Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | BS | 19ABS9909 | Chemistry Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | ES | 19AES0504 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| **TOTAL** | | | | | | | **21.5** | **270** | **630** | **900** |

## II B. Tech – I Semester

| S. No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | |
| 1 | BS | 19ABS9912 | Transform Techniques and Complex Variables | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | ES | 19AES0509 | Basics of Python Programming | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 3 | ES | 19AES0505 | Internet of Things (IoT) | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 4 | PC | 19APC0401 | Electronic Devices and Circuits | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 19APC0402 | Electromagnetic Theory and Transmission Lines | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | PC | 19APC0403 | Signals and Systems | 3 | 1 | 0 | 4 | 30 | 70 | 100 |
| 7 | MC | 19AMC9903 | Environmental Studies | 2 | 0 | 0 | 0 | 30 | - | 30 |
| **Practical** | | | | | | | | | | |
| 8 | ES | 19AES0510 | Basics of Python Programming Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 9 | PC | 19APC0404 | Electronic Devices and Circuits Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 10 | ES | 19AES0506 | Internet of Things (IoT) Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 11 | PC | 19APC0405 | Signals and Systems Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| **TOTAL** | | | | | | | 21.5 | 330 | 700 | 1030 |

## II B. Tech – II Semester

| S. No | Category | Course Code | Course Title | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | |
| 1 | BS | 19ABS9920 | Probability and Random Variables | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | HS | 19AHS9903 | Communicative English II | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 3 | ES | 19AES0302 | Design Thinking and Product Innovation | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 4 | PC | 19APC0208 | Control Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PC | 19APC0406 | Analog Electronic Circuits | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 6 | ES | 19AES0101 | Basic Civil and Mechanical Engineering | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 7 | MC | 19AMC9901 | Biology for Engineers | 2 | 0 | 0 | 0 | 30 | - | 30 |
| **Practical** | | | | | | | | | | |
| 8 | HS | 19AHS9904 | Communicative English II Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 9 | ES | 19AES0303 | Design Thinking and Product Innovation Lab | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 10 | PC | 19APC0407 | Analog Electronic Circuits Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 11 | ES | 19AES0102 | Basic Civil and Mechanical Engineering Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 12 | PR | 19APR0401 | Socially Relevant Projects (15 Hours/Semester) | 0 | 0 | 0 | 0.5 | 50 | - | 50 |
| **TOTAL** | | | | | | | 21.5 | 380 | 700 | 1080 |

## III B. Tech – I Semester

| S. No | Category | Course Code | Course Title | | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | | |
| 1 | PC | 19APC0410 | Digital Electronics and Logic Design | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | PC | 19APC0411 | Antennas and Wave Propagation | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 19APC0412 | Analog and Digital Communications | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PC | 19APC0413 | Integrated Circuits and Applications | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | PE | 19APE0401 | Professional Elective – I | Information Theory and Coding | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19APE0402 | | MATLAB Programming | | | | | | | |
| | | 19APE0403 | | Computer System Architecture | | | | | | | |
| 6 | OE | 19AOE0501 | Open Elective – I (Inter disciplinary) | Database Management System | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19AOE0502 | | Operating Systems | | | | | | | |
| | | 19AOE0202 | | Programmable Logic Controllers | | | | | | | |
| 7 | MC | 19AMC9902 | Constitution of India | | 3 | 0 | 0 | 0 | 30 | - | 30 |
| **Practical** | | | | | | | | | | | |
| 8 | PC | 19APC0414 | Digital Electronics and Logic Design Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 9 | PC | 19APC0415 | Analog and Digital Communications Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 10 | PC | 19APC0416 | Integrated Circuits and Applications Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 11 | PR | 19APR0402 | Socially Relevant Projects (15 Hours/Semester) | | 0 | 0 | 0 | 0.5 | 50 | - | 50 |
| **TOTAL** | | | | | | | | 21.5 | 350 | 630 | 980 |

## III B. Tech – II Semester

| S. No | Category | Course Code | Course Title | | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | | |
| 1 | PC | 19APC0417 | Microprocessors and Microcontrollers | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | PC | 19APC0418 | Digital Signal Processing | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | PC | 19APC0419 | Microwave Engineering and Optical Communications | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | PE | 19APE0404 | Professional Elective - II | Real Time Operating Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19APE0405 | | VLSI Design | | | | | | | |
| | | 19APE0406 | | MEMs | | | | | | | |
| 5 | HE | 19AHE9902 | Humanities Elective - I | Principles of Effective Public Speaking | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19AHEMB01 | | Managerial Economics and Financial Analysis | | | | | | | |
| | | 19AOE0518 | | Scripting Languages | | | | | | | |
| 6 | OE | 19APC0216 | Open Elective-II (Inter disciplinary) | Neural Networks and Fuzzy Logic | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19AHE9907 | | Advanced Optics | | | | | | | |
| | | 19AHE9905 | | Materials Chemistry | | | | | | | |
| 7 | MC | 19AMC9904 | Professional Ethics and Human Values | | 3 | 0 | 0 | 0 | 30 | - | 30 |
| **Practical** | | | | | | | | | | | |
| 8 | PC | 19APC0420 | Microprocessors and Microcontrollers Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 9 | PC | 19APC0421 | Digital Signal Processing Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 10 | PC | 19APC0422 | Microwave Engineering and Optical Communications Lab | | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| 11 | PR | 19APR0403 | Socially Relevant Projects (15 Hours/Semester) | | 0 | 0 | 0 | 0.5 | 50 | - | 50 |
| 12 | PR | 19APR0404 | Industrial Training/ Internship/ Research Projects in National Laboratories/Academic Institutions | | 0 | 0 | 0 | 0 | - | - | - |
| **TOTAL** | | | | | | | | 21.5 | 350 | 630 | 980 |

## IV B. Tech – I Semester

| S. No | Category | Course Code | Course Title | | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | | |
| 1 | PC | 19APC0423 | Digital Image Processing | | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | PC | 19APC0424 | Electronic Measurements and Instrumentation | | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| 3 | OE | 19APC0510 | Open Elective-III (Inter disciplinary) | Computer Networks | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19AOE0304 | | Robotics | | | | | | | |
| | | 19AOE0302 | | Management Science | | | | | | | |
| 4 | PE | 19APE0407 | Professional Elective-III | Radar Systems | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19APE0408 | | Digital System Design | | | | | | | |
| | | 19APE0409 | | RF System Design | | | | | | | |
| 5 | PE | 19APE0410 | Professional Elective-IV | Satellite Communications | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| | | 19APE0411 | | Embedded Systems | | | | | | | |
| | | 19APE0412 | | Digital IC Design | | | | | | | |
| 6 | HE | 19AHE9901 | Humanities Elective – II | Technical Writing | 2 | 0 | 0 | 2 | 30 | 70 | 100 |
| | | 19AHE9903 | | Professional Communication | | | | | | | |
| | | 19AHE9909 | | Quantum Mechanics | | | | | | | |
| **Practical** | | | | | | | | | | | |
| 7 | PC | 19APC0427 | Embedded Systems and UAV Lab | | 0 | 0 | 0 | 1 | 30 | 70 | 100 |
| 8 | PR | 19APR0405 | Socially Relevant Projects (15 Hours/Semester) | | 0 | 0 | 0 | 0.5 | 50 | - | 50 |
| 9 | PR | 19APR0406 | Industrial Training/Internship/Research Projects in National Laboratories/Academic Institutions | | 0 | 0 | 0 | 1.5 | 50 | - | 50 |
| **TOTAL** | | | | | | | | 19 | 310 | 490 | 800 |

## IV B. Tech – II Semester

| S. No | Category | Course Code | Course Title | | Hours per week | | | Credits | Scheme of Examination (Max. Marks) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | | CIE | SEE | Total |
| **Theory** | | | | | | | | | | | |
| 1 | OE | 19AOE0101 | Open Elective – IV (Inter disciplinary) (MOOC-I) | Structural Health Monitoring | 3 | 0 | 0 | 3 | - | - | - |
| | | 19AOE0516 | | R Programming | | | | | | | |
| | | 19APE0208 | | Electricity and Safety Measures | | | | | | | |
| 2 | PE | 19APE0413 | Professional Elective-V (MOOC-II) | Cellular and Mobile Communications | 3 | 0 | 0 | 3 | - | - | - |
| | | 19APE0414 | | Wireless Communications | | | | | | | |
| | | 19APE0415 | | Speech Processing | | | | | | | |
| **Practical** | | | | | | | | | | | |
| 3 | PR | 19APR0407 | Technical Paper Presentation/Seminars | | 0 | 0 | 0 | 0 | 50 | - | 50 |
| 4 | PR | 19APR0408 | Project | | 0 | 0 | 0 | 9 | 60 | 140 | 200 |
| **TOTAL** | | | | | | | | 15 | 110 | 140 | 250 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9901 | Algebra and Calculus | 3 | 1 | 0 | 4 |

**Course Outcomes:**

1.Develop the use of matrix algebra techniques that is needed by engineers for practical applications. 2.Utilize mean value theorems to real life problems.

3. Familiarize with functions of several variables which is useful in optimization.
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

**Unit I : Matrix Operations and Solving Systems of Linear Equations 12 hrs**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem,

**Unit II : Quadratic Forms and Mean Value Theorems 9 hrs**

Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Rolle‘s Theorem, Lagrange‘s mean value theorem, Cauchy‘s mean value theorem, Taylor‘s and Maclaurin's theorems with remainders (without proof);

**Unit III: Multivariable calculus 9 hrs**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

**Unit IV: Multiple Integrals 10hrs**

Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.

**Unit V: Special Functions 10 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel‘s equation, Recurrence formulae or $J_n(x)$, Generating function- Orthoganality of Bessels functions.

**Textbooks:**


1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.


**References:**


1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham amd M.V.S.S.N Prasad, Mathematics – 1, S.Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO2 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO3 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO4 | Po2 : analyse complex engineering problems | 2.1 | 2.1.3 |
| CO5 | Po2 : analyse complex engineering problems | 2.1 | 2.1.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9902 | Applied Physics | 3 | 0 | 0 | 3 |

**Course Outcomes**

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nano materials for engineering applications.

**Unit I : Optics and EM Theory** **10 Hrs**

Interference of light -principle of superposition-Conditions for sustained
Interference-Interference in thin films (reflected light) - Newton‘s Rings -Determination of Wavelength. Diffraction-Fraunhofer diffraction- Single slit and double slit- Diffraction Grating.
Divergence and Curl of Electric and Magnetic Fields - Gauss‘ theorem for divergence and Stokes‘ theorem for

curl
- Maxwell‘s Equations (Quantitative) – Electromagnetic wave - propagation in non-conducting medium - Poynting‘s Theorem.

**Unit II : Lasers and Fiber Optics** **10 Hrs**

Lasers – Introduction – Characteristics – Spontaneous and Stimulated Emission – Einstein Coefficients – Population Inversion – Excitation Mechanism and Optical Resonator - He-Ne Laser -Nd:YAG Laser – Semiconductor Diode Laser – Applications of Lasers and Holography.

Introduction to Optical Fibers – Total Internal Reflection – Critical angle of propagation –Acceptance angle – Numerical Aperture – Classification of fibers based on Refractive index profile – Propagation of electromagnetic wave through optical fiber – modes – importance of V-number-Attenuation, Block Diagram of Fiber optic Communication – Industrial Applications –Fiber optic Sensors.

**Unit III : Dielectric and Magnetic Materials** **8 Hrs**

Introduction—Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations : Electronic and Ionic,(Quantitative), Orientation Polarizations (Qualitative) - Frequency dependence of polarization-Lorentz (internal) field-Claussius-Mosotti equation-Applications of Dielectrics: Ferroelectricity.
Introduction-Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment – Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) – Hysteresis–soft and hard magnetic materials – Magnetic memory device applications .

**Unit IV: Semiconductors** **8 Hrs**

Origin of Energy bands (Qualitative)-Intrinsic and Extrinsic semiconductors –Direct and indirect band gap semiconductors- Density of charge carriers – Fermi energy–-Dependence of Fermi energy on carrier concentration and temperature – Electrical conductivity – Drift and Diffusion currents – Continuity equation - Hall effect - Applications of Hall effect and Semiconductors.

**Unit V: Superconductors and Nanomaterials**

Superconductors-Properties-Meissner‘seffect-BCSTheory(Qualitative) - Josephson effect (AC&DC)-Types of Superconductors-Applications of superconductors.

Nanomaterials–Significance of nanoscale–: Physical, Mechanical, Magnetic, Optical properties of nanomaterials – Synthesis of nanomaterials:Top-down-Ball Milling, Bottom-up-Chemical vapour deposition–Characterization of nanomaterials : X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM)-Applications of Nanomaterials.

**Textbooks:**

1. M. N. Avadhanulu, P. G. Kshirsagar &TVS Arun Murthy‖ A Text book of Engineering Physics‖-S. Chand Publications,11th Edition2019.
2. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning,2012.

**References:**

1. K Thyagarajan –Engineering Physics‖,-Mc Graw Hill Publishing Company Ltd, 2016
2. Shatendra Sharma, Jyotsna Sharma, ― Engineering Physics‖, Pearson Education,2018
3. David J.Griffiths,―Introduction to Electrodynamics‖-4/e, Pearson Education, 2014
4. T Pradeep, –A Text book of NanoScience and NanoTechnology‖-Tata Mc Graw Hill 2013.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO1 : Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 2 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 3 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 4 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 5 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0501 | Problem Solving and Programming | 3 | 1 | 0 | 4 |

**Course Objectives:**

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

**Unit 1:**

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

**Unit 2:**

**Introduction to computer problem solving:** Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

**Fundamental algorithms:** Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

**Unit 3:**

**Types, Operators, and Expressions:** Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

**Input and output:** standard input and output, formatted output-Printf, formatted input-Scanf.

**Control Flow:** Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do- while, break and continue, Goto and labels.

**Functions and Program Structure:** Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

**Unit 4:**

**Factoring methods:** Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

**Pointers and arrays:** Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

**Array Techniques:** Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the $k^{th}$ smallest element

**Unit 5:**

**Sorting and Searching:** Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

**Structures:** Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

**Some other Features**: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.

**Text Books**:


1. Pradip Dey, and Manas Ghosh, ―Programming in C‖, 2018, Oxford University Press.
2. R.G. Dromey, ―How to Solve it by Computer‖. 2014, Pearson.

3. Brian W. Kernighan, and Dennis M. Ritchie, –The C Programming Language‖, 2nd Edition, Pearson.

**Reference Books:**

1. RS Bichkar ―Programming with C‖, 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, –Information Technology in Theory‖, 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, –Programming with C‖, 4th Edition, 2019, McGraw Hill Education.

**Course Outcomes:**

1. Construct his own computer using parts.
2. Recognize the importance of programming language independent constructs
3. Solve computational problems
4. Select the features of C language appropriate for solving a problem
5. Design computer programs for real world problems
6. Organize the data which is more appropriated for solving a problem

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering Knowledge | 1.3 | 1.3.1 |
| CO2 | PO2: Problem analysis | 2.1 | 2.1.1 |
| CO3 | PO2: Problem analysis | 2..2 | 2.2.2 |
| CO4 | PO2: Problem analysis | 2.1 | 2.1.1 |
| CO5 | PO2: Problem analysis | 2.3 | 2.3.1 |
| CO6 | PO2: Problem analysis | 2.2 | 2.2.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AHS9901 | Communicative English I | 2 | 0 | 0 | 2 |

**Course Outcomes:**

At the end of the course, the learners will be able to

1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Formulate sentences using proper grammatical structures and correct word forms
3. Speak clearly on a specific topic using suitable discourse markers in informal discussions
4. Write summaries based on global comprehension of reading/listening texts
5. Produce a coherent paragraph interpreting a figure/graph/chart/table
6. Take notes while listening to a talk/lecture to answer questions

**Unit 1 : 10 Hours (4L+6P)**

**Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.
**Reading for Writing:** Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.
**Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and un countable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

**Unit 2: 10 Hours (4L+6P)**

**Listening:** Answering a series of questions about main idea and supporting ideas after listening to audio texts.
**Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks.**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
**Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.
**Grammar and Vocabulary:** Cohesive devices -linkers, sign posts and transition signals; use of articles and zero article; prepositions.

**Unit 3: 10 Hours (4L+6P)**

**Listening:** Listening for global comprehension and summarizing what is listened to.
**Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
**Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
**Grammar and Vocabulary:** Verbs -tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

**Unit 4: 8 Hours (2L+6P)**

**Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
**Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicate processes or display complicated data.
**Writing:** Information transfer; describe, compare, contrast, identify significance / trends based on information provided in figures/charts/graphs/tables.
**Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.

**Unit 5:** **8 Hours (2L+6P)**
**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences.
**Grammar and Vocabulary:** Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject- verb agreement)
Suggested books:
**Text Book**: English all round: Communication Skills for Under graduation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

**Reference Books**
1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge,2014. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley,ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.

**Sample Web Resources**
Grammar/Listening/Writing, 1-language.com, http://www.5minuteenglish.com/, https://www.englishpractice.com/, Grammar/Vocabulary, English Language Learning Online
http://www.bbc.co.uk/learningenglish/, http://www.better-english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games
Free Rice Vocabulary Game Reading
https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short-stories.htm, https://www.english-online.at/
**Listening**
https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html
**Speaking**
https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises
**All Skills**
https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/ Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner‘s dictionaries

| List of COs | PO no. and keyword | Competency Indicator: Description | Performance Indicator: Description |
|---|---|---|---|
| CO1. | PO6<br>Apply contextual knowledge to assess societal, health, safety, legal, and cultural issues. | 6.1 | 6.1.1 |
| CO2. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.1 | 10.1.1 |
| CO3. | PO9-Function effectively as an individual, and as a member or leader in diverse teams, and in | 9.2 | 9.2.1 |

| | | | |
|---|---|---|---|
| | multidisciplinary settings. | | |
| CO4. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.1 . | 10.1.1 |
| CO5 | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1 |
| CO6. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ALC0401 | Electronics and Communication Engineering Workshop | 0 | 0 | 2 | 1 |

**Course Outcomes:** Students will be able to
CO1: Identify discrete components, ICs and assemble simple electronic circuits over a PCB CO2: Testing of various components, Interpret specifications (ratings) of the component
CO3: Identify discrete components and ICs and Assemble simple electronic circuits over a PCB CO4: Disassembling and assembling a Personal Computer and make the computer ready to use CO5: Make use of Office tools for preparing documents, spreadsheets and presentations

**List of Exercises / Experiments**

1. Familiarization of commonly used Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.

* Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students

2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO (Find the Amplitude and Frequency of a signal) DSO, Function Generator, Frequency counter.

* Provide some exercises so that electronic measuring instruments are learned to be used by the students

3. Electronic Components: Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's- Write important specifications/ratings of components & ICs and submit it in the form of a report) – Functionality, type, size, color coding, package, symbol, cost etc.

4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments

5. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.

6. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
*Provide some exercises so that students are familiarized in using EDA tools
*Provide some exercises so that students are familiarized in using Active HDL/Xilinx/Cadence tools

7. Introduction to MATLAB Tools and MASM: Learning of basic functions for MATLAB tools and MASM.

8. Familiarization with Computer Hardware & Operating System:
*Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
*Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and troubleshooting a computer.
*Install Operating system on the computer. Students should record the entire installation process.

9. Familiarization with Office Tools
*Word Processor: Able to create documents using the word processor tool. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied.
*Spreadsheet: Able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting

and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells.

*Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

10. Familiarization of PA system with different microphones, loud speakers, mixer etc. Represent the same in the form of diagrams, write specifications and submit it in the form of a report.

11. Understand working of different electronic instruments for various fields like medical instruments, telecommunication devices etc.

12. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, and Mobile Phone. Prepare demo boards/charts of various communication systems.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1:Engineering knowledge | 1.1 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO3: Design/Development of solutions | 3.2 | 3.2.1 |
| CO2 | PO1: Engineering knowledge | 1.4 | 1.4.1 |
| | PO4: Conduct investigations of complex problems | 4.1 | 4.1.2 |
| | | | 4.1.3 |
| | | | 4.1.4 |
| CO3 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO4 | PO5: Modern tool usage | 5.1 | 5.1.1 |
| | | 5.2 | 5.2.1 |
| | | 5.3 | 5.3.1 |
| | PO10: Communication | 10.1 | 10.1.1 |
| CO5 | PO2:Problem analysis | 2.2 | 2.1.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9907 | Applied Physics Lab | 0 | 0 | 3 | 1.5 |

**Course Outcomes**

1. Analyze the wave properties of light and the interaction of energy with the matter.
2. Apply electromagnetic wave propagation in different guided media.
3. Asses the electromagnetic wave propagation and its power in different media
4. Analyze the conductivity of semiconductors.
5. Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.

**List of Experiments**

1. Determination of the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Dispersive power of a diffraction grating
5. Study of the Magnetic field along the axis of a circular coil carrying current.
6. Study the variation of B versus H of the magnetic material (B-H curve)
7. Determination of the numerical aperture of a given optical fiber and angle of acceptance.
8. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
9. Determination of the energy gap of a semiconductor
10. Determination of crystallite size using X-Ray diffraction spectra.
11. Determination of Wavelength of LASER using diffraction grating.
12. Determination of particle size using LASER.
13. Determination of the resistivity of semiconductor by Four probe method.
14. Determination of dielectric constant by charging and discharging method.
15. Study the temperature dependence of resistance of a thermister.

**References:**


1. S. Balasubramanian, M.N.Srinivasan, –A Text book of Practical Physics‖-S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php-VirtualLabs, Amrita University.


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.3 |
| CO: 2 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.1 |
| CO: 3 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.1 |
| CO: 4 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.2 |
| CO: 5 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0503 | Problem Solving and Programming Lab | 0 | 0 | 4 | 2 |

**Laboratory Experiments #**

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. Design an algorithm and implement using C language the following exchanges a ← b ← c ← d ← a
6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series $1 – x^2/2! + x^4/4! – x^6/6! + ....$
10. Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1and100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
20. Design a C program which sorts the strings using array of pointers.

Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

**Course outcomes:**

1. Construct a Computer given its parts (L6)
2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

**References:**


1. B. Govindarajulu, ―IBM PC and Clones Hardware Trouble shooting and Maintenance‖, Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, ―How to Solve it by Computer‖. 2014, Pearson.


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO2: Problem analysis | 2.1 | 2.1.1 |
| CO2 | PO2: Problem analysis | 2..2 | 2.2.2 |
| CO3 | PO2: Problem analysis | 2.1 | 2.1.1 |
| CO4 | PO2: Problem analysis | 2.3 | 2.3.1 |
| CO5 | PO2: Problem analysis | 2.2 | 2.2.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AHS9902 | Communicative English - I Lab | 0 | 0 | 2 | 1 |

**Course Outcomes**

1. Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
2. Apply communication skills through various language learning activities
3. Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
4. Evaluate and exhibit acceptable etiquette essential in social and professional settings.
5. Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

**Syllabus**

**Unit 1**

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

**Unit 2**

1. JAM
2. Small talks on general topics
3. Debates

**Unit 3**

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

**Unit4**

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

**Unit 5**

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

**Software Source:**

K-Van Solutions Software

**Reference:**

Teaching English - British Council

| List of COs | PO No. and keyword | Competency Indicator: Description | Performance Indicator: Description |
|---|---|---|---|
| CO1 | PO10:<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.2 | 10.1.1 |
| CO2 | PO10:<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1 |
| CO3 | PO10:<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.1 |
| CO4 | PO 9:<br>Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. | 9.2 | 9.2.1 |
| CO5 | PO10:<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.1 |

# B.Tech
# I Year II Semester

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0201 | Network Theory | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES:**

CO1. Solve network problems using mesh and nodal analysis techniques
CO2. Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition, Miller and Millman theorems
CO3. Compute responses of first order and second order networks using time & frequency domain analysis
CO4. Design resonant circuits for given bandwidth
CO5. Utilize z, y, ABCD and h parameters for analyzing two port circuit behavior

**UNIT I: Introduction to Electrical Circuits**

Passive components and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Source transformation Kirchoff‗s laws, Star–to-Delta or Delta-to-Star Transformations, Mesh analysis and Nodal analysis problem solving, Super node and Super mesh for DC Excitations

**UNIT II: Network Theorems**

Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Miller Theorem, Tellegan‘s Theorem, Compensation theorem - problem solving using dependent sources also, Duality and dual networks.

**UNIT III: Transients**

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non- homogenous, problem solving using R-L-C elements with DC excitation and AC (sinusoidal) excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

**UNIT IV: Resonance and Coupled Circuits**

Self inductance, Mutual inductance, dot rule, coefficient of coupling, Analysis of multi-winding coupled circuits, series & parallel connection of coupled inductors.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti resonance at all frequencies.

**UNIT V: Two Port Networks & Network Functions**

Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, interconnection of two port networks.

Concept of complex frequency, driving point and transfer functions for one port and two port network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function

**Text Books:**

1. W. H. Hayt and J. E. Kemmerly, ―Engineering Circuit Analysis‖, McGraw Hill Education, 2013.
2. M. E. Van Valkenburg, ―Network Analysis‖, Prentice Hall, 2006.

**References:**

1. D. Roy Choudhury, ―Networks and Systems‖, New Age International Publications, 1998.
2. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
3. Bhise, Chadda, Kulshreshtha, ―Engineering network analysis and filter design‖ Umesh Publication, 2000.
4. Joseph Edminister and Mahmood Nahvi, ―Electric Circuits‖, Schaum‘s Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO-1 –engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO-2-problem analysis | 2.2 | 2.2.2 &2.2.3 |
| CO3 | PO-4-conduct investigations of complex problems | 4.1 | 4.1.1 |
| CO4 | PO-4- conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO5 | PO-1- engineering knowledge | 1.4 | 1.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9906 | Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |

**Course Outcomes:**

1. Apply the mathematical concepts of ordinary differential equations of higher order.
2. Solve the differential equations related to various engineering fields .
3. Identify solution methods for partial differential equations that model physical processes .
4. Interpret the physical meaning of different operators such as gradient, curl and divergence .
5. Estimate the work done against a field, circulation and flux using vector calculus .

**UNIT I: Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral ($e^{ax}$, sinax (or) cosax, $X^k$, $e^{ax}v$, x v(x)), method of variation of parameters, simultaneous linear equations with constant coefficients.

**UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy‘s and Legendre‘s linear equations, Applications to simple pendulum, oscillations of a spring, L-C-R Circuit problems and Mass spring system.

**UNIT III: Partial Differential Equations – First order**

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

**UNIT IV:Vector differentiation**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities

**UNIT V: Vector integration**

Line integral-circulation-work done, surface integral-flux, Green‘s theorem in the plane (without proof), Stoke‘s theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

**Text Books :**


1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.


**References:**


1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi publication,2008
4. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO2 | PO2:Analyse complex engineering problems | 2.1 | 2.1.3 |
| CO3 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO4 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.1 |
| CO5 | PO2:Analyse complex engineering problems | 2.1 | 2.1.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9904 | CHEMISTRY | 3 | 0 | 0 | 3 |

**Course Outcomes:**

1. Understand the behaviour of, and interactions between mater and energy at both the atomic and molecular levels
2. Compare the materials of construction for battery and electrochemical sensors
3. Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
4. HPLC and GC methods used for separation of gaseous and liquid mixtures.
5. Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

**Unit 1: Structure and Bonding Models (10 hrs)**

Planck's quantum theory, Schrodinger wave equation, significance of $\Psi^1$ and $\Psi^2$ , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital‘s in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of $O_2$ , $N_2$ and CO, calculation of bond order.

**Unit 2: Electrochemistry and Applications (10 hrs)**

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nern‘st equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

**Unit 3: Polymer Chemistry (10 hrs)**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

**Unit 4: Instrumental Methods and Applications (10 hrs)**

Principle and applications of Colorimetry, AAS, AES, UV-Viscible spectrophotometry (Beer-Lambert‘s law, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

**Unit 5: Water Technology (10 hrs)**

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World

health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

**Text books:**

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins‘ Physical Chemistry, 10/e, Oxford University Press, 2010.

**Reference books:**

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 2 | PO 1: Apply the knowledge of basic science | 1.4 | 1.4.1 |
| CO: 3 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 4 | PO 4: Analyse complex engineering problems | 2.4 | 2.4.4 |
| CO: 5 | PO 1: Apply the knowledge of Basic science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0502 | Data Structures | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

**Unit 1: Introduction**

Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

**Unit – 2: Stack, Queue and Linked lists**

Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

**Unit 3: Trees**

Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B +Trees.

**Unit – 4 : Graphs and Hashing**

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

**Unit – 5: Files and Advanced sorting**

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

**Text Books:**

1. Ellis Horowitz and Sartaj Sahni, ―Fundamentals of Data Structures in C‖, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, ―File Organization and Processing‖, Wiley and Sons, 1988.

**Reference Books:**

1. D. Samanta, –Classic Data Structures‖, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, –Advanced Data Structures‖, Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, –Data Structures A Pseudo code Approach with C‖, Second Edition, Cengage Learning 2005.

**Course Outcomes:**

1. Select Appropriate Data Structure for solving a real world problem
2. Select appropriate file organization technique depending on the processing to be done
3. Construct Indexes for Databases
4. Analyse the Algorithms
5. Develop Algorithm for Sorting large files of data

| List of COs | PO no. and keyword | Competency | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering Knowledge | 1.4 | 1.4.1 |
| CO2 | PO4: Conduct investigations of complex problems | 4.1 | 4.1.4 |
| CO3 | PO1: Engineering Knowledge | 1.3 | 1.3.1 |
| CO4 | PO2: Problem analysis | 2.1 | 2.1.2 |
| CO5 | PO2: Problem analysis | 2.3 | 2.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ALC0301 | Engineering Workshop Practice | 0 | 0 | 2 | 1 |

**Course Outcomes**:

CO: 1 Apply wood working skills in real world applications.
CO: 2 Build different parts with metal sheets in real world applications.
CO: 3 Apply fitting operations in various applications.
CO: 4 Apply different types of basic electric circuit connections.
CO: 5 Demonstrate soldering and brazing.

**Wood Working:**
Familiarity with different types of woods and tools used in wood working and make following joints
a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint

**Sheet Metal Working:**
Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

**Fitting:**
Familiarity with different types of tools used in fitting and do the following fitting exercises
a) V-fit b) Dovetail fit
c) Semi-circular fit d) Bicycle tyre puncture and change of two wheeler tyre

**Electrical Wiring:**
Familiarities with different types of basic electrical circuits and make the following connections
a) Parallel and series b) Two-way switch c) Godown lighting
d) Tube light e) Three phase motor f) Soldering of wires

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 2 | PO 3: Design/Development of Solutions | 3.2 | 3.2.1 |
| CO: 3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 4 | PO 3: Design/Development of Solutions | 3.2 | 3.2.2 |
| CO: 5 | PO 2: Problem analysis | 2.3 | 2.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0301 | Engineering Graphics Lab | 1 | 0 | 4 | 3 |

**Course Outcomes**:

CO: 1 Draw various curves applied in engineering.
CO: 2 Show projections of solids and sections graphically.
CO: 3 Draw the development of surfaces of solids.
CO: 4 Use computers as a drafting tool.
CO: 5 Draw isometric and orthographic drawings using CAD packages.

## Manual Drawing

**UNIT I**

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid
c) Involutes

**Projection of points, lines:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

**UNIT II**

**Projections of Planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

**Projections of Solids:** Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

**UNIT III**

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

## Computer Aided Drafting:

**UNIT IV**

**Introduction to AutoCAD:** Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Dimensioning principles and conventional representations.

**UNIT V**

**Orthographic Projections:** Systems of projections, conventions and application to orthographic projections.

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

**Text Books and Reference Books:**


1. K. L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N. D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agrawal & C. M. Agrawal, Engineering Drawing, Tata McGraw-Hill

**Additional Sources**

YouTube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 2 | PO 3: Design/Development of Solutions | 3.2 | 3.2.1 |
| CO: 3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 4 | PO 3: Design/Development of Solutions | 3.2 | 3.2.2 |
| CO: 5 | PO 5: Problem analysis | 5.1 | 5.1.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0203 | Network Theory Lab | 0 | 0 | 3 | 1.5 |

**COURSE OUTCOMES:**
CO1.Verify Kirchhoff‘s laws and network theorems CO2.Measure time constants of RL & RC circuits CO3.Analyze behavior of RLC circuit for different cases CO4. Design resonant circuit for given specifications
CO5.Characterize and model the network in terms of all network parameters

**List of Experiments:**
**Any 10 of the following experiments are to be conducted in Hardware & Simulation (Multisim/Open source software):**
1. Verification of Kirchoff‘s Laws
2. Apply Mesh & Nodal Analysis techniques for solving electrical circuits (problems with dependent sources also)
3. Verification of Superposition & Reciprocity Theorem
4. Verification of Thevenin‘s and Norton‘s Theorem
5. Verification of Maximum Power Transfer Theorem
6. Verification of Millman and Miller Theorm
7. Measure and calculate RC time constant for a given RC circuit
8. Measure and calculate RL time constant for a given RL circuit
9. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a given series RLC circuit for following cases:

(i) $\zeta = 1$ (critically damped system)
(ii) $\zeta > 1$(over damped system)
(iii) $\zeta < 1$ (under damped system)

Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
10. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
11. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency , Bandwidth , Q – factor.
12. Measure and calculate Z, Y parameters of two-port network.
13. Measure and calculate ABCD & h parameters of two-port network.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO-1 –engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO-2-problem analysis | 2.2 | 2.2.2 &2.2.3 |
| CO3 | PO-4-conduct investigations of complex problems | 4.1 | 4.1.1 |
| CO4 | PO-4- conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO5 | PO-1- engineering knowledge | 1.4 | 1.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19ABS9909 | CHEMISTRY LAB | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**

1. To familiarize the students with the basic concepts of chemistry of materials
2. Prepare advanced polymer materials
3. Measure the strength of an acid present in secondary batteries
4. To familiarize with digital and instrumental methods of analysis

**List of Experiments:**

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of $TIO_2$/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO:1 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.3 |
| CO:2 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.1 |
| CO:3 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.1 |
| CO:4 | PO 4: Analysis and interpretation of data | 4.3 | 4.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech I Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AES0504 | Data Structures Lab | 0 | 0 | 3 | 1.5 |

**Course Objectives:**

1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

**Laboratory Experiments**

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using _Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

**Course Outcomes:**

1. Select the data structure appropriate for solving the problem
2. Implement searching and sorting algorithms
3. Design new data types
4. Illustrate the working of stack and queue
5. Organize the data in the form of files

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering Knowledge | 1.4 | 1.4.1 |
| CO2 | PO 2: Problem analysis | 2.2 | 2.2.4 |
| CO3 | PO1: Engineering Knowledge | 1.3 | 1.3.1 |
| CO4 | PO1: Engineering Knowledge | 1.4 | 1.4.1 |
| CO5 | PO1: Engineering Knowledge | 1.4 | 1.4.1 |

# B.Tech
# II Year I Semester

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI AUTONOMOUS**
**AK 19 Regulations**

**Year :** II **Semester** : I **Branch of Study :** ECE and EEE

| | | | |
|---|---|---|---|
| **Subject Code:19ABS9912** | **Subject Name: Transform Techniques and Complex Variables.** | **L T P**<br>**3 0 0** | **Credits:3** |

**Course Outcomes:**

1) Find the differentiation and integration of complex functions used in engineering problems
2) Apply the Laplace transform for solving differential equations (continuous systems)
3) Find the Fourier series of periodic signals
4) Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
5) Develop Z transform techniques for discrete time systems

**Unit I : Laplace transforms**

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by $t^n$, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, applications to ordinary differential equations. (Without proofs)

**Unit II: Fourier series**

Dirichlet‟s conditions, Fourier series, conditions for a Fourier expansion, functions of any period, odd and even functions - half range series.

**Unit III: Fourier transforms**

Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem

**Unit IV: Z-Transforms**

Definition of Z-transform, elementary properties, linearity property, damping rule, shifting $u_n$ to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z-transform, convolution theorem, formation of difference equations, solution of difference equations using Z- transforms.

**Unit V : Complex Variables**

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate. Complex integration, Cauchy theorem (without proof), Cauchy integral formula (without proof), Taylor‟s series, zeros of analytic functions, singularities, Laurent‟s series, residues, Cauchy residue theorem (without proof).

**Textbooks:**


1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.


**References:**


1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – II, S.Chand publications.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO2 : Analyse complex engineering problems | 2.1 | 2.1.3 |
| CO2 | PO1:Apply the knowledge of mathematics | 1.1 | 1.1.2 |
| CO3 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.2 |
| CO4 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.2 |
| CO5 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI AUTONOMOUS**
**AK 19 Regulations**

**Year :** II **Semester** : I **Branch of Study :** ECE

| **Subject Code:19AES0509** | **Subject Name:Basics of Python Programming** | **L T P**<br>**2 0 0** | **Credits:2** |
|---|---|---|---|

Course Objectives:

- To learn the fundamentals ofPython
- To elucidate problem-solving using a Python programminglanguage
- To introduce a function-oriented programming paradigm throughpython
- To get training in the development of solutions using modularconcepts
- To introduce the programming constructs ofpython

**Unit – I**

Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

**Unit – II**

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

**Unit – III**

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms. Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Case Study: Reading word lists, Search, Looping with indices.

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

**Unit – IV**

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables. Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

**Unit – V**

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, Thestrmethod, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets,

Counters, defaultdict, Named tuples, Gathering keyword Args.

**Course Outcomes:**

Student should be able to

- Apply the features of Python language in various realapplications.
- Select appropriate data structure of Python for solving aproblem.
- Design object-oriented programs using Python for solving real-worldproblems.
- Apply modularity toprograms.

**Text books:**

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O‟Reilly, 2016.

**Reference Books:**

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill,2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE,2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press,2019

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI AUTONOMOUS**

**AK 19 Regulations**

**Year :** II **Semester** : I **Branch of Study :** ECE

| **Subject Code:19AES0505** | **Subject Name:Internet of Things** | **L T P**<br>**2 0 0** | **Credits:2** |
|---|---|---|---|

Course Outcomes:

CO1: Interpret the vision of IoT from a globalcontext.

CO2: Determine the Market perspective ofIoT.

CO3: Compare and Contrast the use of Devices, Gateways and Data Management inIoT.

CO4: Implement state of the art architecture inIoT.

CO5: Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

**Unit-I**

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

**Unit-II**

M2M to IoT - A Market Perspective- Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview- Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

**Unit-III**

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

**Unit-IV**

IoT Architecture-State of the Art - Introduction, State of the art.

**Unit-V**

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Industrial Automation- Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things

**TEXT BOOK:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.(ISBN-13:978-0124076846)

**REFERENCE BOOKS / WEBLINKS:**

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN-13:978-8173719547)

2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013. (ISBN-13: 978-1430257400)

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 5: Modern Tool Usage | 5.1 | 5.1.1 |
| CO: 2 | PO 5: Modern Tool Usage | 5.2 | 5.2.1 |
| CO: 3 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO: 4 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |
| CO: 5 | PO 6: Engineer & Society | 6.1 | 6.1.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) R19 Regulations**
**Year: II Semester: I Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0401 | Electronic Devices & Circuits | 3 | 0 | 0 | 3 |

**Course Outcomes**: Students will be able to
CO1: Understand the operation of diodes and special electronic devices. CO2: Know operation of different rectifiers without and filters.
CO3: Understand construction, operation of BJT, FET in different configurations CO4: Know the need of biasing and design of DC biasing circuits.
CO5: Design of amplifiers with BJTs and FETs by using small signal model

**Unit I: PN Junction Diode & Special Diode Characteristics**
Review of semiconductor Physics n and p-type semiconductors, Intrinsic &Extrinsic Semiconductors and their Fermi Levels, Open circuited p-n junction, Biased p-n junction, Current components in PN junction Diode, Diode Equation, V-I characteristics of p-n junction diode, Temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.
Special Electronic Devices - Construction, Operation, V-I Characteristics of
Zener diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel diode, DIAC, TRIAC, SCR, UJT
**Unit II: Rectifiers & Filters**
Introduction to DC Power supply , Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, derivations of rectifier parameters , Rectifier circuits-Operation, Input and Output waveforms, Filters, , Capacitor filter, Inductor filter , L-section filter, π-section filter, Multiple L-section and Multiple π section filter, comparison of various filter circuits in terms of ripple factors.
**Unit III: Transistor Characteristics**
**BJT**: Bi-polar Junction Transistor, Ebers-Moll model of a transistor, Transistor current components, Transistor as an amplifier, Transistor equation, Transistor configurations, Input- Output Characteristics of Transistor in Common Base, Common Emitter and Common Collector configurations, Punch through-Reach through, Photo transistor, Typical transistor junction voltage values.

**FET:** BJT Versus FET,Junction Field Effect TransistorJFET Types, Construction, Operation, parameters, Drain and Transfer characteristics, MOSFET Types -Enhancement and Depletion Types-Construction, Operation, Characteristics.
**Unit IV: Transistor Biasing & Thermal Stabilization**
Need for biasing, operating point, Load line analysis, BJT biasing-Methods, Basic stability Fixed bias, Collector to base bias, Self-bias, Stabilization against variations in $V_{BE}$, $I_C$, and β, stability factors, (S, S‟, S”), Bias compensation, Thermal runaway, Thermal stability.
FET Biasing- methods and stabilization.
**Unit V: Small Signal Low Frequency Transistor Amplifier Models**
**BJT**: Two port network, Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters, analysis of CB, CE and CC amplifiers using exact analysis, approximate hybrid model, analysis of CB, CE and CC amplifiers using approximate hybrid model, Comparison of transistor amplifiers.
**FET**: Generalized analysis of small signal model, analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

**Text Books:**

1. David A.Bell, "Electronic Devices and circuits",5th edition, Oxford university press 2015.
2. Thomas L.Floyd, "Electronic Devices", 9th edition, Pearson Education, 2013
3. Robert L.Boylestad and Louis Nashelsky, "Electronic Devices & circuit theory", Pearson Education, 11th Edition 2013.

**Reference Books:**

1. Donald Neamen, "Electronic Circuits: Analysis and Design", 3 rd edition, McGraw-Hill Education, 2011.
2. Muhammad Rashid, "Microelectronic Circuits: Analysis & Design", 2nd edition, Cengage Learning,2010.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO4 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) R19 Regulations**
**Year: II Semester: I Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0402 | Electromagnetic Theory & Transmission Lines | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to
CO1: Understand basic laws of electric fields and Solve problems related to electric fields. CO2: Apply laws of magnetic fields and Solve problems related to magnetic fields.
CO3: Analyze electric and magnetic fields at the interface of different media and derive Maxwell‟s equations for static and time varying fields.
CO4: Proficient with analytical skills for understanding propagation of electromagnetic waves in different media.
CO5: Understand the concept of transmission lines & their applications.

**Unit I:**
Coulomb‟s Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell‟s Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson‟s and Laplace‟s Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

**Unit II:**
Biot-Savart Law, Ampere‟s Circuital Law and Applications, Magnetic Flux Density, Maxwell‟s Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere‟s Force Law, Inductances and Magnetic Energy, Illustrative Problems.

**Unit III:**
Faraday‟s Law and Transformer e.m.f, Inconsistency of Ampere‟s Law and Displacement Current Density, Maxwell‟s equations for time varying fields, Maxwell‟s Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric- Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

**Unit IV:**
Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

**Unit V:**
Transmission Lines: Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.

**Text Books:**

1. Matthew N.O. Sadiku, “Elements of Electromagnetics”, Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics”, TMH, 7th ed., 2006.
3. John D. Krauss, “Electromagnetics”, McGraw- Hill publications.

**References:**

4. Electromagnetics, Schaum‟s outline series, Second Edition, Tata McGraw-Hill publications, 2006.
5. E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, PHI, 2nd 4. Edition, 2000.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | | 1.4 | 2.3.1 |
| CO2 | PO 3: Design/Development of solutions | 3.1 | 3.1.1 |
| CO3 | PO 3: Design/Development of solutions | 3.1 | 3.1.1 |
| CO4 | PO 3: Design/Development of solutions | 3.1 | 3.1.1 |
| | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.2 |
| | | | 4.3.3 |
| CO5 | PO 3: Design/Development of Solutions | 3.1 | 3.1.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) AK 19 Regulations**

**Year: II** **Semester: I** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0403 | Signals & Systems | 3 | 1 | 0 | 4 |

**Course Outcomes:** Students will be able to
CO1. Understand mathematical description and representation of continuous time and discrete time signals.
CO2: Resolve signals in frequency domain using Fourier series and Fourier Transforms. CO3: Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
CO4: Understand the properties of systems, response of LTI systems and filters. CO5: Able to analyz**e** LTI systems using Laplace and Z-Transforms.

**Unit I: Signals**
Introduction: Definition of Signals, classification of signals: continuous time and discrete time signals, standard signals: impulse function, step function, ramp function complex exponential and sinusoidal signals, signum and sinc functions. Operations on signals and sequences. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, mean square error, orthogonality of complex functions. Representation of signals using Fourier series: Trigonometric Fourier series (TFS) and complex exponential Fourier series (CEFS). Illustrative problems.

**Unit II:Fourier Transforms**
Continuous Time Fourier Transform, definition, properties, Fourier Transforms of standard signals, complex Fourier spectrum, inverse Fourier Transform. Discrete Time Fourier Transform, definition, properties of Discrete Time Fourier Transform transforms of standard signals. Introduction to Hilbert Transform. Illustrative problems.

**Unit III:Sampling Theorem**
Definition of sampling, types: impulse and pulse sampling. Sampling theorem for band limited signals-Graphical and analytical proof, Nyquist criterion, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Sampling theorem for bandpass signals. Illustrative problems.

**Unit IV: Systems**
Definition of Systems, Classification of Systems, impulse response, response of a linear time invariant system, Convolution and correlation: time domain, frequency domain and Graphical representation. Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time. Illustrative problems.

**Unit V: Laplace Transforms & Z Transform**

Laplace transforms: Review of Laplace transforms, concept of Region of Convergence (ROC) for Laplace transforms, inverse Laplace transform, constraints on ROC for various classes of signals, properties of Laplace Transforms. Analysis of CT-LTI systems using Laplace transforms: causality and stability.

Z-Transforms: Review of Z-Transforms, concept of Region of Convergence (ROC) for Z- transforms inverse Z- transform, partia and constraints on ROC for various classes of signals, properties of Z-Transforms. Analysis of DT-LTI systems using Z- transforms: causality and stability. Illustative problems.

**Text Books:**

1. B.P. Lathi, Signals, Systems & Communications, BS Publications, 2003.
2. A.V. Obppenheim, A.S. Willsky and S.H. Nawab, Signals and Systems PHI, 2nd Edition. 2009.

**References:**

1. Simon Haykin and Van Veen, Signals & Systems, Wiley, 2nd Edition.
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms,and Applications, 4 th Edition, PHI, 2007.
3. BP Lathi, Principles of Linear Systems and Signals Oxford University Press, 2015.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 3: Design/Development of Solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3. |
| | | | 4.3.4 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.4 | 2.4.1 |
| | | | 2.4.2 |
| | | | 2.4.3 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO3 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| | PO 10: Communication | 10.3 | 10.3.1 |
| | | | 10.3.2 |
| CO4 | PO 4: Conduct investigations of complex problems | 4.2 | 4.2.1 |
| | | | 4.2.2 |
| | | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3 |
| | | | 4.3.4 |
| CO5 | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(Autonomous)**
AK19 Regulations

**Year: II B.Tech** **Semester: I** **Branch: Common to All**

| | | | | | |
|---|---|---|---|---|---|
| Subject Code 19AMC9903 | Subject Name Environmental Studies | L<br>2 | T<br>0 | P<br>0 | Credits 0 |

Course Outcomes

1. Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
5. To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

**UNIT – I** **18Hr**

**Multidisciplinary Nature** of**Environmental Studies:** Introduction Multidisciplinary Nature of Environmental Studies Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources:** Renewable and non-renewable energy resources –Natural resources and associated problems.

**Forest resources:** Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

**Water resources**: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.

**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.

**Energy resources:** Renewable and non-renewable energy resources.

**UNIT – II** **20Hr**

**Ecosystems:** Concept of an ecosystem. – Structure and functions of anecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Biodiversity And Its Conservation :** Introduction- Definition:genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation
– Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III** **10Hr**

**Environmental Pollution:** Definition, Causes, effects and its controlmeasures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

**Solid Waste Management:** Causes**,** effects and control measures ofurban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

**UNIT – IV** **15Hr**

**Social Issues and the Environment:** From Unsustainable toSustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement

and rehabilitation of people Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act Publicawareness.

**UNIT – V** **10Hr**

**Human Population and the Environment:** Population growth,variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**TEXT BOOKS:**

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

**REFERENCES:**

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO:1 | PO1:Apply the knowledge of Basic science | 1.2 | 1.2.1 |
| CO:2 | PO1:Apply the knowledge of Basic science | 1.2 | 1.2.1 |
| CO:3 | PO1:Apply the knowledge of Basic science | 1.2 | 1.2.1 |
| CO:4 | PO1:Apply the knowledge of Basic science | 1.2 | 1.2.1 |
| CO:5 | PO1:Apply the knowledge of Basic science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year: II B.Tech** **Semester: I** **Branch: Common to All**

| Subject Code 19AES0510 | Subject Name<br>Basics of Python Programming Lab | L T P<br>0 0 2 | Credits 1 |
|---|---|---|---|

**Course Objectives**:

To train the students in solving computational problems

To elucidate solving mathematical problems using Python programming language

To understand the fundamentals of Python programming concepts and its applications To understand the object-oriented concepts using Python in problem solving.

**Laboratory Experiments**

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a ScientificCalculator

**2.** Write a function that draws a grid like thefollowing**:**

```
+ - - - - + - - -
      - +
   ||          |
   ||          |
   ||          |
   ||          |
+ - - - - + - - -
      - +
   ||          |
   ||          |
   ||          |
   ||          |
+ - - - - + - - -
      - +
```

3. Write a function that draws a Pyramid with #symbols #

```
#                              #        #
#                          # # # #
#    #                       # # # # #
```

Up to 15 hashes at the bottom

4. Using turtles concept draw a wheel of yourchoice

5. Write a program that draws ArchimedeanSpiral

6. The letters of the alphabet can be constructed from a moderate number of basic elements, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of thealphabet.

7. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January1970.

```
>>> import time
>>>time.time() 1437746094.5735
958
```

Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

8. Given n+r+1 <= 2r . n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies theabove.

9. Write a program that evaluates Ackermannfunction

10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a

numerical approximation of 1/ **π**:
Write a function called estimate_pi that uses this formula to compute and return an estimate of **π.**

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

It should use a while loop to compute terms of the summation until the last term is smaller than $1e^{-15}$ (which is Python notation for $10^{-15}$). You can check the result by comparing it to math.pi.

11. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-infunctions.
12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
13. Given a word which is a string of characters. Given an integer say „n", Rotate each character by „n" positions and print it. Note that „n" can be positive ornegative.
14. Given rows of text, write it in the form ofcolumns.
15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don"t consider special characters). Draw a histogram to represent thesame
16. Write program which performs the following operations on list"s. Don"t use built-infunctions

a) Updating elements of alist
b) Concatenation oflist"s
c) Check for member in thelist
d) Insert into thelist
e) Sum the elements of thelist
f) Push and pop element oflist
g) Sorting oflist
h) Finding biggest and smallest elements in thelist
i) Finding common elements in thelist

17. Write a program to count the number of vowels in aword.
18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them tolowercase.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of- copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in differenteras.
20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of- copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from thefile.
21. Consider all the files on your PC. Write a program which checks for duplicate files in your PC and displays their location. Hint: If two files have the same checksum, they probably have the samecontents.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported byPython.
24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class andfailed.
25. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap yearrules.
26. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.( 0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <=59)

Lab Outcomes:
Student should be able to
Design solutions to mathematicalproblems. Organize the data for solving theproblem.
Develop Python programs for numerical and text basedproblems. Select appropriate programming construct

for solving theproblem. Illustrate object orientedconcepts.

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python 3”, 3rdedition,
Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, “Head First Python a Brain Friendly Guide” 2nd Edition, O‟Reilly,2016
3. DainelY.Chen “Pandas for Everyone Python Data Analysis” Pearson Education,2019

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
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**Year: II** **Semester**: **I** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0404 | Electronic Devices & Circuits Lab | 0 | 0 | 2 | 1 |

**Course Outcomes:** Students will be able to

CO1: Test and operate diodes and special electronic devices. CO2: Construct and operate rectifiers without and with filters CO3: Construct and operate BJT, FET in different configurations CO4: Design DC biasing circuits for Transistors

CO5: Design amplifiers using BJTs and FETs.

**List of Experiments:**

1. PN Junction Diode Characteristics
2. Zener Diode Characteristics and Zener Diode as Voltage Regulator.
3. Rectifiers (With and Without Filter).
4. BJT Characteristics (CB Configuration).
5. BJT Characteristics (CE Configuration).
6. FET Characteristics (CS Configuration).
7. SCR Characteristics
8. Transistor Biasing
9. BJT-CE Amplifier
10. Emitter Follower-CC Amplifier 11.FET-CS Amplifier

12.UJT Characteristics

**Equipment required for Laboratory**

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO4 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year: II** **Semester**: **I** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0506 | Internet of Things (IoT) Lab | 0 | 0 | 2 | 1 |

**Course Outcomes:** Students will be able to
CO1: Choose the sensors and actuators for an IoT application. CO2: Select protocols for a specific IoT application
CO3: Utilize the cloud platform and APIs for IoT application.
CO4: Experiment with embedded boards for creating IoT prototypes. CO5: Design a solution for a given IoT application.

**Lab of Experiments:**

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Identify a problem in your local area or college which can be solved by integrating the things you learned so far and create a prototype to solve it (Mini Project).

**Text Book:**

1. Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012

**References:**

**1.** ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
**2.** The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

**Additional Sources:** https://www.arduino.cc/ https://www.raspberrypi.org/

| COs | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 5: Modern tool usage | 5.1 | 5.1.1 |
| CO2 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| CO3 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO4 | PO 3: Design/Development of solutions | 3.4 | 3.4.1 |
| CO5 | PO 6: The engineer and society | 6.1 | 6.1.1 |

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**Year: II** **Semester**: **I** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0405 | Signals & Systems Lab | 0 | 0 | 3 | 1.5 |

**Course Outcomes:**Students will be able to
CO1: Understand basics of MATLAB syntax, functions and programming.
CO2: Generate and characterize various signals and perform the basic operations.
CO3: Design and analyze linear time-invariant (LTI) systems and compute its response. CO4: Analyze the spectral characteristics of signals using Fourier analysis.
CO5: Analyze the systems using Laplace transform and Z-transform.

**List of Experiments:**

1. Write program to generate Standard Signals/Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings. Plot the discrete spectrum of the signal.
4. Write program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write program to convolve two discrete time sequences. Plot all the sequences.
6. Write program to find autocorrelation and cross correlation of sequences.
7. Write program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write program for removal of noise by Autocorrelation / Cross correlation
12. Write a program for waveform Synthesis using Laplace Transform and To plot pole-zero diagram in S-plane / Z-plane of given signal/sequence

**Note:** All the experiments are to be simulated using MATLAB or equivalent software

**Text Books**:

B.P. Lathi, Linear Systems and Signals, 2nd Edition, Oxford University Press, India. Barry Van Veen& Simon Haykin "Signals and Systems, 2 nd Edition" Willey Publishers
Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems". 2nd Edition, PHI, India.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 3: Design/Development of Solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3. |
| | | | 4.3.4 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.4 | 2.4.1 |
| | | | 2.4.2 |
| | | | 2.4.3 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO3 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| | PO 10: Communication | 10.3 | 10.3.1 |
| | | | 10.3.2 |
| CO4 | PO 4: Conduct investigations of complex problems | 4.2 | 4.2.1 |
| | | | 4.2.2 |
| | | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3 |
| | | | 4.3.4 |
| CO5 | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |

# B.Tech
# II Year II Semester

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI AUTONOMOUS**

**AK 19 Regulations**

**Year :** II **Semester** : II **Branch of Study :** ECE

| | | | |
|---|---|---|---|
| **Subject Code:**19ABS9920 | **Subject Name**: Probability and Random variables | L T P<br>3 0 0 | **Credits**:3 |

**Course Outcomes**:

1) Able to know the fundamental concepts of Probability theory
2) Analyze continuous and discrete-time random processes
3) **Analyze the**concepts of a Random Variable and operations that may be performed on a single Random variable
4) Analyze the characterize probability models and function of random variables based on multiples random variables.
5) Understand the concepts of expected Value of a Function of Random Variables andGaussian Random Variables

**UNIT I :PROBABILITY**

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes,,Theorem, and Independent Events.

**UNIT II :THE RANDOM VARIABLE:**

Definition of a Random Variable, Conditions for a function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions and their Properties- Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh distributions.
Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

**UNIT III: OPERATION ON ONE RANDOM VARIABLE –EXPECTATIONS:**

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev,,s Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

**UNIT IV:MULTIPLE RANDOM VARIABLES:**

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal, and Equal Distributions.

**UNIT V:OPERATIONS ON MULTIPLE RANDOM VARIABLES:**

Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, linear Transformations of Gaussian Random Variables.

**Text Books:**

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, “Probability, Random Variables and Stochastic Processes”,

PHI, 4th Edition, 2002.

**References:**

1. R.P. Singh and S.D. Sapre, "Communication Systems Analog & Digital", TMH, 1995.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing",Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition, 1999.
4. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
5. Probability Theory and Stochastic Processes-MallikarjunaReddy,cengage Learning

| **List of COs** | **PO no. and keyword** | **Competency Indicator** | **Performance Indicator** |
|---|---|---|---|
| CO1 | PO1: Apply the knowledge of mathematics | 1.1 | 1.1.2 |
| CO2 | PO2: Identify, formulate, analyse complex engineering problems. | 2.4 | 2.4.3 |
| CO3 | PO1: Apply the knowledge of mathematics | 1.1 | 1.3.1 |
| CO4 | PO2: Identify, formulate, analyse complex engineering problems. | 2.2 | 2.1.3 |
| CO5 | PO2: Identify, formulate, analyze complex engineering problems. | 2.2 | 2.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES:: TIRUPATI**
**(AUTONOMOUS)**
**AK 19 Regulations**

**B. Tech II Year** **Semester** : II **Branch :** Common to all

| | | | |
|---|---|---|---|
| Subject Code: **19AHS9903** | Subject Name: **Communicative English II** | **L T P 2 0 0** | Credits:2 |

**Course Outcomes**

At the end of the course, the learners will be able to

1. Prioritize information from reading texts after selecting relevant and useful points
2. Paraphrase short academic texts using suitable strategies and conventions
3. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
4. Participate in group discussions using appropriate conventions and language strategies
5. Prepare a CV with a cover letter to seek internship/ job
6. Collaborate with a partner to make presentations and Project Reports

**Syllabus**

**Unit 1** **(10 hrs)**

**Listening** : Listening for presentation strategies and answering questions on the speaker, audience, and key points.
**Speaking:** Formal presentations using PPT slides without graphic elements.
**Reading:** Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style.
**Writing:** Paraphrasing; using quotations in writing; usingacademic style - avoiding colloquial words and phrases.
**Grammar and Vocabulary:** Formal/academicwords and phrases.

**Unit 2** **(10 hrs)**

**Listening:** Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse.
**Speaking:** Formal presentations using PPT slides with graphic elements.
**Reading:** Understand formal and informal styles; recognize the difference between facts and opinions.
**Writing:** Formal letter writing and e-mail writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette.
**Grammarand Vocabulary:** Phrasal prepositions; phrasal verbs.

**Unit 3** **10(hrs)**

**Listening:** Identifying views and opinions expressed by different speakers while listening to discussions.
**Speaking:** Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.
**Reading:** Identifying claims, evidences, views, opinions and stance/ position.
**Writing:** Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.
**Grammar andVocabulary:** Language for different functions such as stating a point, expressing opinion, agreeing/disagreeing, adding information to what someone has stated, and asking for clarification.

**Unit 4:** **(8 hrs)**

**Listening:** Understanding inferences; processing of information using specific context clues from the text.
**Speaking:** Group discussion; reaching consensus in group work (academic context).

**Reading:** Reading for inferential comprehension.
**Writing:** Applying for internship/ job - Writing one‟s CV/Resume and cover letter. **Grammar and Vocabulary:** Active and passive voice – use of passive verbs in academic writing.

**Unit 5:**
**(8hrs)**
**Listening:** Understanding inferences - processing of explicit information presented in the text andimplicit information inferable from the text or from previous/background knowledge.
**Speaking:** Formal team presentations on academic/ general topics using PPT slides.
**Reading for Writing:** Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references.
**Grammar and Vocabulary:** Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

***Course Materials would be compiled and provided to learners and teachers ReferenceBooks**


1. Bailey, Stephen. *Academic writing: A handbook for international students*.Routledge,2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition,2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*.CUP, 2012.Sample Web Resources Grammar/Listening/Writing 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/


**Grammar/Vocabulary**
English Language Learning Online, http://www.bbc.co.uk/learningenglish/, http://www.better- english.com/, http://www.nonstopenglish.com/, https://www.vocabulary.com/, BBC Vocabulary Games, Free Rice Vocabulary Game

**Reading**
https://www.usingenglish.com/comprehension/, https://www.englishclub.com/reading/short- stories.htm, https://www.english-online.at/

**Listening**
https://learningenglish.voanews.com/z/3613, http://www.englishmedialab.com/listening.html
**Speaking**
https://www.talkenglish.com/, BBC Learning English – Pronunciation tips, Merriam-Webster – Perfect pronunciation Exercises
**All Skills**
https://www.englishclub.com/, http://www.world-english.org/, http://learnenglish.britishcouncil.org/, Online Dictionaries, Cambridge dictionary online, MacMillan dictionary, Oxford learner‟s dictionaries

**References:**


1. www.pointblank7.in> News & Politics> Features dt. 15.05.2019
2. Learning English a Communication Approach by Orient Longman Pvt Ltd. Hyderabad , 2005.


| List of COs | PO no. and keyword | Competency Indicator: | Performance Indicator: |
|---|---|---|---|
| CO1. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.1 | 10.1.1<br>10.1.2 |

| | | | |
|---|---|---|---|
| CO2 | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1<br>10.3.2 |
| CO3. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.2 |
| CO4. | PO9-Functioneffectivelyasanindividual,andasamemberorleaderindiverse teams, and in multidisciplinarysettings. | 9.2 | 9.2.1<br>9.2.2<br>9.2.3 |
| CO5. | PO10-Able to comprehend and write effective reports and design documentation. | 10.3 | 10.3.1<br>10.3.2 |
| CO6. | PO10-Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1<br>10.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::TIRUPATI (AUTONOMOUS)**
**AK19 Regulations**

**Year: II** **Semester: II** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0302 | Design Thinking and Product Innovation | 2 | 0 | 0 | 2 |

**Course Outcomes:**

CO1. Generate and develop different design ideas.
CO2. Appreciate the innovation and benefits of design thinking.
CO3.Develop innovative products or services for a customer base using ideation techniques.
CO4. Build prototypes for complex problems using gathered user requirements.
CO5.Improve prototype by testing it with a specific set of users for making it sustainable by following ethics

**UNIT I: ENGINEERING DESIGN**

Introduction to design, characteristics of successful product development, product development process, identification of opportunities, product planning, Innovation in product development.

UNIT II: **DESIGN THINKING PROCESS**

Design thinking: Introduction, Principles, the process, Innovation in design thinking, benefits of Design thinking, design thinking and innovation, case studies

**UNIT III: IDEATION**

Idea generation: Introduction, techniques, Conventional methods, Intuitive methods, Brainstorming, Gallery method, Delphi method, Synectics, etc Select ideas from ideation methods, case studies

**UNIT IV: PROTOTYPING**

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

**UNIT V: TESTING PROTOTYPES**

Prototyping for digital products: What‘s unique for digital, Preparation; Prototyping for physical products: What‘s unique for physical products, Preparation; Testing prototypes with users.

**TEXTBOOKS:**


**1.** Christoph Meinel and Larry Leifer, “Design Thinking”, Springer, 2011
**2.** Kathryn McElroy, ―Prototyping for Designers: Developing the best Digital and Physical Products, O‘Reilly,2017.


**REFERENCES:**


1. https://www.interaction-design.org/literature/article/5-stages-in-the-design- thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design- challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | **PO 3:** Design/Development of Solutions | 3.3 | 3.3.1 |
| CO: 2 | **PO 2:** Problem analysis | 2.1 | 2.1.3 |
| CO: 3 | **PO 3:** Design/Development of Solutions | 3.2 | 3.2.1 |
| CO: 4 | **PO 3:** Design/Development of Solutions | 3.1 | 3.1.1<br>3.1.5 |
| CO: 5 | **PO 4:** Conduct investigations of complex problems | 4.3 | 4.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year: II** **Semester: II** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0208 | Control Systems | 3 | 0 | 0 | 3 |

**Course Outcomes:** Students will be able to

**CO1:** Develop the transfer function of Mechanical systems, Electrical systems and Electro mechanical systems.

**CO2:** Develop the transfer function using Block Diagram reduction and Signal flow graph technique of LTI systems.
**CO3:** Obtain the time domain specifications and error constants of a First order and second order systems.
**CO4:** Determine the stability of a linear time invariant systems using Routh criterion, Root locus, Bode plots, polar plots and Nyquist plot.
**CO5:** Derive state space model of a given physical system and solve the state equation.

**Unit-I: Introduction to Control Problem**

System Representation-Classification of systems-Feedback Control-Benefits of Feedback- Open-Loop and Closed-loop systems. Advantages and Dis-advantages of control systems-Industrial Control examples – Transfer functions and limitations. Mathematical models of Physical systems-Transfer function models of linear time-invariant systems- Electrical, Mechanical and Electro-Mechanical Systems-Electrical Analogues- Block diagram and their Reduction techniques-Signal flow graph.

**Unit-II: Time Response and Stability Analysis**

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time- response-Steady state error -Static and generalized error constants.

**Unit-III: Stability Analysis**

Concept of stability–Absolute and Relative Stability analysis-Routh-Hurwitz Criteria, Root-Locus technique. Construction of Root-loci, adding poles and zeros to G(s)H(s) on the root loci.

**Unit-IV: Frequency-response Analysis**

Introduction to Frequency domain specifications -Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – Gain and Phase margin. Design P, PI, and PD & PID controllers

**Unit-V: State variable Analysis (8 hours)**

Concepts of state variables- State space model- Diagonalization of State Matrix- Solution of state equations-Eigen values and Stability Analysis-State Transition Matrix (STM) -Concept of controllability and observability.

**Text Books :**

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

**Reference Books:**

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1:Engineering knowledge | 1.1 | 1.1.1 |
| | PO3:Design/Development of solutions | 3.2 | 3.2.3 |
| CO2 | PO1:Engineering knowledge | 1.1 | 1.1.1 |
| | PO3:Design/Development of solutions | 3.2 | 3.2.3 |
| CO3 | PO1:Engineering knowledge | 1.1 | 1.1.1 |
| | PO2: Problem analysis | 2.1 | 2.1.2 |
| CO4 | PO1:Engineering knowledge | 1.1 | 1.1.1 |
| | PO4:Conductinvestigations of complex problems | 4.1 | 4.1.2 |
| CO5 | PO1:Engineering knowledge | 1.1 | 1.1.1 |
| | PO2: Problem analysis | 2.1 | 2.1.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year: II** **Semester:II** **Branch of Study: ECE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0406 | Analog Electronic Circuits | 3 | 0 | 0 | 3 |

**Course Objectives:** Students will be able to
CO1: Understand multi stage amplifiers using BJT and FET.
CO2: Understand high frequency model and analyze its frequency responses. CO3: Understand feedback amplifiers and oscillators along with design.
CO4: Understand power amplifiers.
CO5: Understand tuned amplifiers and their effect on bandwidth and stability.

**Unit I: Multi Stage Amplifiers**
Introduction, Classification of Amplifiers, Analysis of Cascaded amplifiers, Different Coupling Schemes used in Amplifiers, Analysis of two stage RC Coupled Amplifier, high input resistance transistor amplifiers- Darlington Pair Amplifier, Boot Strap Emitter Follower, Cascade Amplifier, Differential Amplifier, Analysis of multi stage amplifiers using FET.

**Unit II: High Frequency Transistor Amplifiers- BJT**
Transistor at High Frequencies, Hybrid- $\pi$ Common Emitter transistor model, Validity of hybrid $\pi$ model, determination of high-frequency parameters in terms of low-frequency parameters, Single Stage CE Amplifier frequency response with short circuit load and resistive load, gain cutoff frequencies, Gain- Bandwidth Product, Emitter follower at higher frequencies, Illustrative design problems.
**FET:**FET at High Frequencies, High Frequencies FET Model, Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

**Unit III: Feedback Amplifiers and Oscillators**
Conceptsof Feedback, Classification of Feedback Amplifiers, General Characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier characteristics: Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative design Problems.
Introduction, Classification of Oscillators, Conditions for Oscillations, RC and LC Oscillators, RC-Phase shift and Wien-Bridge Oscillators, Generalized Analysis of LC Oscillators, Hartley and Colpitts Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Illustrative design problems.

**Unit IV: Power Amplifiers**
Introduction, Classification of power amplifiers**,** Class A large signal Amplifiers-Series fed and Transformer coupled amplifier, Efficiency, Class B Amplifier -Push-pull amplifiers, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Cross over Distortion, Phase Inverters, Class AB operation, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink, Second harmonic Distortions, Higher order harmonic Distortion.

**Unit V: Tuned Amplifiers**
Introduction, series resonance, Transformation of resistor and inductor ,Parallel Resonance, Q-Factor, Impedance variation near resonance,Classification of tuned amplifiers, Small Signal Tuned Amplifier – Capacitance and transformed coupled single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

**Text Books:**

1. J. Millman and C.C. Halkias, “Integrated Electronics”, McGraw-Hill, 1972.
2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, McGraw Hill.
3. Salivahanan, N.Suressh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill, Second Edition.

**References:**

1. Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, 7th Edition
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO4 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY &SCIENCES:: TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year: II Semester: II Branch of Study: ECE,EEE &CSE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0101 | Basics of Civil & Mechanical Engineering | 3 | 0 | 0 | 3 |

Course Outcomes:
CO 1: understand principles of Stress and Strain and able to draw SFD & BMD for simply supported beams and cantilever beams.
CO 2: understand basic principles of Strain Measurement and apply the concepts of Strain Rosettes for strain measurement.
CO 3: understand common building materials used in construction and analyze charactestics of common building materials.
CO 4: Apply velocity ratio concepts in power transmission. CO 5: Understand the principles of CAD, CAM & CIM. (L.2)

**PART – A**

**UNIT – I:**
Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment – Torsion . Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

**UNIT – II:**
Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channel strain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstone bridge.

**UNIT – III:**
Characteristics of common building materials – Brick – Types – Testing; Timber – Classification – Seasoning – Defects in Timber ; Glass – Classification – uses; steel and its applications in construction industry.

**PART – B**

**UNIT – IV: Power Plants**
Introduction, Classification of power plants – working principle of steam, gas, diesel, hydro- electric and nuclear power plants – merits and demerits – pumps, and turbines – working principle of reciprocating pumps (single acting and double acting) – centrifugal pump.

**UNIT – V: IC Engines**
Internal Combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

**UNIT – VI: Computer Aided Design & Manufacturing**
Terminology of Refrigeration and air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – window and split type room air conditioner.

Text Books:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering",Tata McGraw Hill Publishing Co., NewDelhi.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P)Ltd.

References:

1. S.Trymbaka Murthy., "Computer Aided Engineering Drawing" , UniversitiesPress
2. Seetharaman S., "Basic Civil Engineering", AnuradhaAgencies.
3. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", AnuradhaPublishers, Kumbakonam.
4. Er. R. Vaishnavi,Basic Civil and Mechanical Engineering, 2/e, S. ChandPublications.

| List of COs | PO no. and keyword | Competency | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO2: Problem analysis | 2.2 | 2.2.1 |
| | | 2.3 | 2.3.1 |
| CO2 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO2: Problem analysis | 2.2 | 2.2 |
| | | 2.3 | 2.3.1 |
| CO3 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO2: Problem analysis | 2.2 | 2.2.1 |
| | | 2.3 | 2.3.1 |
| CO 4 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| CO 5 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | PO2: Problem analysis | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(Autonomous) AK19 Regulations**

**II.B.Tech Semester: II Branch: Common to ALL**

| Subject Code | Subject Name | L | T | P | Credits 0 |
|---|---|---|---|---|---|
| 19AMC9901 | Biology For Engineers | 2 | 0 | 0 | |

**Course Outcomes:**

1. Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
2. Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
3. Brief about human physiology.
4. Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
5. Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals.

**Unit I: Introduction to Basic Biology (10 hrs)**

Evolution: Different patterns of evolution, Darwin‟s theory of evolution, Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification, Tissue Engineering.

**Unit II: Introduction to Biomolecules (10hrs)**

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

**Unit III: Human Physiology (08hrs)**

Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle, Central Nerves System and Excretory system.

**Unit IV: Introduction to Molecular Biology and recombinant DNA Technology (08hrs)**

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. DNA technology. Introduction to gene cloning.

**Unit V: Application of Biology (10 hrs)**

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, Properties and Classification of virus, Immune response to virus, Definitions-Pandemic, Epidemic and outbreak, pandemic alert system ranges, Prevention of pandemic disease and pandemic preparation.

**Text books:**


1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017


**Reference Books:**


1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A Global Approach”, Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology – 2014.
6. Richard Dawkins, River Out of Eden: A Darwinian View of Life

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 2 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 3 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 4 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 5 | PO1:Apply the knowledge of basic science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI (AUTONOMOUS)**
**AK 19 Regulations**

**B. Tech II- Year** **Semester** : II **Branch: Common to all**

| Subject Code | Subject Name | L | T | P | Credit:1 |
|---|---|---|---|---|---|
| 19AHS9904 | **Communicative English II Lab** | 0 | 0 | 2 | |

**Course Outcomes**

1. Prioritize information from reading texts after selecting relevant and useful points.
2. Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
3. Participate in Group discussions using appropriate conventions and language strategies.
4. Paraphrase short academic text using suitable strategies and conventions.
5. Collaborate with a partner to make presentations and Project

**Syllabus**

**Unit 1**

**Oral Presentation:** Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. Listening for presentation strategies and answering questions- Formal presentations using PPT slides without graphic elements

**Unit 2**

Power point Presentation/Poster Presentation: Understand formal and informal styles; recognize the difference between facts and opinions. Following an argument/ logical flow of thought; answering questions, formal presentations using PPT slides with graphic elements.

**Unit 3**

Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. Identifying claims, evidences, views, opinions and stance/ position. Identifying views and opinions expressed by different speakers while listening to discussions.

**Unit4**

Reading for inferential comprehension. Group discussion; reaching consensus in group work(academic context). Understanding inferences; processing of information using specific context clues from the text. **Unit 5**

Formal team presentations on academic/ general topics using PPT slides-identifying sections in project reports; understanding the purpose of each section; significance of references.

**References:**


1. Effective Technical Communication,Rizvi,Tata McGraw-Hill Education2007
2. A Practical Course in Effective English Speaking skills, J.K.Gangal, PHI Learning Pvt Ltd, 2012
3. A Course in Communication Skills, P.KiranmaiDutt,GeethaRajeevan,C.L.N.Prakash, 2008.
4. Technical Communication, Meenakshi Raman, Oxford University Press
5. Professional Communication Skills, Er.A.K.Jain, Pravin S.R.Bhatia, Dr.A.M.Sheikh, S.Chand& Company Ltd, 2001.

| List of COs | PO No. and keyword | Competency Indicator: | Performance Indicator |
|---|---|---|---|
| CO1. | PO10<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.1 | 10.1.1<br>10.1.2 |
| CO2. | PO10<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1<br>10.3.2<br>. |
| CO3. | PO9<br>Functioneffectivelyasanindividual,andasamember orleaderindiverse teams, and in multidisciplinarysettings. | 9.2. | 9.2.1<br>9.2.2<br>9.2.3 |
| CO4. | PO10<br>Able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions | 10.3 | 10.3.1<br>10.3.2 |
| CO5. | PO10<br>Able to comprehend and write effective reports and design documentation. | 10.3 | 10.3.1<br>10.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year:II** **Semester:II** **Branch of Study : Common toall**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0303 | Design Thinking and Product Innovation Lab | 0 | 0 | 2 | 1 |

**Course Outcomes:**

CO 1: Design and Fabricate using PCB
CO 2: Design Analog and Digital Circuits using PCBs and ICs.
CO 3: Design measuring devices for temperature, pressure, humidity, water level, smart lighting.
CO4: Design and simulate various filters for Image processing using MATLAB
CO 5: Design and Implement Interfacing of Various devices to 8086/8051

**List of Experiments (Minimum of 10 experiments)**

1. PCB Design and Fabrication
2. Design an Analog circuit using PCB
3. Design a Digital circuit using ICs
4. Design a device for measurement of Temperature/ pressure.
5. Design a device for measurement of Humidity.
6. Design a device for Water Level Indicator.
7. Design a Smart Lighting system.
8. Design and simulate a filter for removing noise in image using Mat lab
9. Design and simulate a filter for Enhance contrast in image using Mat lab
10. Design and Implement Interfacing of 8279 Keyboard / Display Controller with 8086/8051
11. Design and Implement Interfacing of 8255 PPI with 8086/8051
12. Design and Implement Interfacing of 8259 Interrupt Controller with 8086/8051

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | **PO 1:** Engineering knowledge | 1.3 | 1.3.1 |
| CO: 2 | **PO 2:** Problem analysis | 2.1 | 2.1.2 |
| CO: 3 | **PO 5:** Modern tool usage | 5.3 | 5.3.2 |
| CO: 4 | **PO 4:** Conduct investigations of complex problems | 4.1 | 4.1.2<br>4.1.3 |
| CO: 5 | **PO 3:** Design/Development of Solutions | 3.4 | 3.4.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(Autonomous) AK19 Regulations**

**Year:II** **Semester**: **II** **Branch of Study: ECE**

| Course Code | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0407 | Analog Electronic Circuits Lab | 0 | 0 | 3 | 1.5 |

**Course Outcomes:** Students will be able to
CO1: Design multi stage amplifiers using BJT and FET.
CO2: Design high frequency model and analyze its frequency responses. CO3: Design feedback amplifiers and oscillators along with design.
CO4: Understand different power amplifiers and find their conversion efficiency CO5: Designtuned amplifiers and their effect on bandwidth and stability

**List of Experiments:**

**PART A: List of Experiments :( Minimum of Ten Experiments has to be performed)**

1. Determination of $f_T$ of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt"s Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

**PART B: Equipment required for Laboratory Software:**

i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

**Hardware:**

13. Regulated Power supplies
14. Analog/Digital Storage Oscilloscopes
15. Analog/Digital Function Generators
16. Digital Multimeters
17. Decade Résistance Boxes/Rheostats
18. Decade Capacitance Boxes
19. Ammeters (Analog or Digital)
20. Voltmeters (Analog or Digital)
21. Active & Passive Electronic Components
22. Bread Boards

23. Connecting Wires
24. CRO Probes etc.

**Note:**The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory**.**

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO3 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO4 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| CO5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.3 | 2.3.1 |
| | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES,TIRUPATI (AUTONOMOUS)**
**AK19Regulations**

**Year:II** **Semester: II** **Branch of Study :ECE,EEE&CSE**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AES0102 | Basic Civil and Mechanical Engineering Lab | 0 | 0 | 3 | 1.5 |

**Course Outcomes:** Students will be able to
CO1: Impart basic principles of bending test on Cantilever beam and simply supported beam CO2: Understand principles of strain measurement using electrical strain gauges
CO3: Impart concepts of Torsion, compression and water absorption CO4: Apply velocity ratio concepts in power transmission
CO5: Understand the principles of CAD, CAM & CIM

**PART - A**

**Laboratory Experiments:**

1. Bending test on (Steel/Wood) Cantileverbeam.
2. Bending test on (Steel/Wood) simply supportedbeam.
3. Use of electrical resistance straingauges.
4. Compression test onBricks
5. Water absorption test onBricks
6. Torsiontest.
7. Tests on closed coiled and open coiled helicalsprings

**PART – B**

**The following contents are to be done by any 2D software package**

1. Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating,scaling,
2. Mirroring, layers, templates, polyline, trimming, extending, stretching, fillets, arrays, dimensions.
3. Dimensioning principles and conventionalrepresentations.
4. Any three simple 2D diagram by using softwarepackage.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO2: Problem analysis | 2.2 | 2.2.1 |
| | | 2.3 | 2.3.1 |
| CO2 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| | PO2: Problem analysis | 2.2 | 2.2.1 |
| | | 2.3 | 2.3.1 |
| CO3 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| CO 4 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | | 1.3 | 1.3.1 |
| CO 5 | PO1: Engineering knowledge | 1.2 | 1.2.1 |
| | PO2: Problem analysis | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |

# B.Tech
# III Year I Semester

**ANNAMAC**
**HARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0410 | DIGITAL ELECTRONICS AND LOGIC DESIGN | 3 | 0 | 0 | 3 |

**Course Outcomes:**
After completion of the course, student will be able to
**CO1:** Understand various number systems, Boolean Functions and Logic gates.
**CO2:** Apply k-map and Q-M methods to minimize and realize switching functions.
**CO3:** Analyze and Design combinational logic circuits
**CO4:** Analyze and Design sequential logic circuits
**CO5:** Analyze and Compare different types of Programmable logic devices.

**UNIT I**
**Number System & Boolean Algebra:**
Digital Systems, Binary Numbers, Number base conversions, complements of numbers, Signed binary numbers, Binary codes.
Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

**UNIT II**
**Gate Level Minimization:**
Introduction to K-Map, four variable & Five variable K-map, POS & SOP Simplification, don't care conditions, NAND & NOR Implementation, Other two-level Implementation, Ex-or Function, Tabular Method-Simplification of Boolean function using Tabulation Method.

**UNIT III**
**Combinational Logic Circuits:**
Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Code Converters, Magnitude comparator, Decoder, Encoders, Multiplexers, De-multiplexer

**UNIT IV**
**Sequential Logic Circuits:**
Sequential Circuits, Latches, Flips-Flops - RS, JK, Master-Slave JK, D & T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters.
Asynchronous sequential circuits - Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.

**UNIT V**
**Programmable Devices:**
Memory organization, classification of semiconductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD, Flash memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

**Text Books:**

1. M.Morris Mano & Michel D. Ciletti,"Digital Design", 5th Edition Pearson.
2. Zvi Kohavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", 3rd Edition Cambridge.

**References:**


1. Subratha Goshal, "Digital Electronics", Cambridge
2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD


| CO | PO | CI | PI |
|---|---|---|---|
| **CO1** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO2** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO3** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO4** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO5** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0411 | ANTENNAS AND WAVE PROPAGATION | 3 | 0 | 0 | 3 |

**Course Outcomes:**
After completion of the course, student will be able to
**CO1:** Apply parametric equations for the calculation of antenna parameters in the far field region.
**CO2:** Identify Loop antenna, helical antenna, horn antenna and its parameters.
**CO3:** Compute Micro-strip antenna, Reflector and Lens antennas and its parameters.
**CO4:** Analyze principle of pattern multiplication for antenna arrays
**CO5:** Explain different modes of Wave propagation in atmospheric layers.

**UNIT - I**
**Antenna Basics:** Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain, Antenna Apertures, Effective height, Field Zones, Polarization – Linear, Elliptical, & Circular polarizations, Antenna impedance, Front–to-back ratio, Antenna theorems.
**Dipole Antennas:** Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole– Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, Fields from oscillating dipole, Illustrative problems.

**UNIT- II**
**VHF, UHF and Microwave Antennas - I**: **Loop Antennas** - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, **Arrays with Parasitic Elements** - Yagi - Uda Arrays, Folded Dipoles & their characteristics. **Helical Antennas**- Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. **Horn Antennas**- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

**UNIT - III**
**VHF, UHF and Microwave Antennas - II**: **Micro strip Antennas**- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, **Reflector antennas** - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, **Lens Antennas** - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

**UNIT- IV**
**Antenna Arrays:** Definition, Patterns, arrays of 2 Isotropic sources Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, Antenna,
**Measurements**: Introduction, Concepts- Reciprocity, Near and Far Fields, Pattern Measurement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

**UNIT – V**
**Wave Propagation:** Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts.
**Ground wave propagation -** Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections.
**Space wave propagation** - Introduction, Super refraction, duct propagation, fading and path loss calculations.
**Sky wave propagation** - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between

MUF and Skip distance, Multi-HOP propagation, Illustrative problems.

**TEXT BOOKS:**

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, "Antennas and wave propagation," TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems," PHI, 2ndEdn, 2000.

**REFERENCES:**

1. C.A. Balanis, "Antenna Theory- Analysis and Design," John Wiley & Sons, 2 ndEdn., 2001.
2. K.D. Prasad, SatyaPrakashan, "Antennas and Wave Propagation," Tech. India Publications, New Delhi, 2001.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO2:Problem analysis | 2.1 | 2.1.2 |
| CO3 | PO2:Problem analysis | 2.3 | 2.3.2 |
| CO4 | PO3: Design/Development of Solutions | 3.2 | 3.2.2 |
| CO5 | PO2:Problem analysis | 2.2 | 2.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0412 | ANALOG AND DIGITAL COMMUNICATIONS | 3 | 0 | 0 | 3 |

**Course Outcomes:**
Upon completing this course, the student will be able to
CO1. Describe of various amplitude modulation and demodulation techniques.
CO2. Understand various angle modulation and demodulation techniques.
CO3. Explain AM, FM Transmitters and Receivers.
CO4. Analyze and design the various pulse modulation techniques.
CO5. Design various digital carrier modulation techniques and baseband transmission.

**UNIT-I:**
**Amplitude Modulation:** Modulation, Amplitude Modulation, Limitations and Modifications of Amplitude Modulation-switching modulator, detection of AM waves: envelope detector, DSB-SC modulation- Time and frequency domain description, Balanced modulators, Synchronous Detector, Costas Receiver, Quadrature Carrier Multiplexing, SSB modulation Generation - frequency and phase discrimination methods , Detection methods, VSB modulation, generation and detection method

**UNIT-II:**
**Angle Modulation:** Angle modulation, FM, PM, Relationship between FM and PM, NBFM, WBFM, Transmission bandwidth of FM waves, Generation of FM: Direct, Indirect Demodulation of FM signals : Balanced slope detector, PLL, Noise in AM and FM

**UNIT III:**
**Transmitters & Receivers:** AM Transmitters, FM Transmitters, Radio Receivers-types, RF Section and Characteristics, Mixer, IF section, AGC, Frequency Tracking , RF receivers
**Pulse Modulation:** PAM, Pulse time modulation –PWM and PPM, Generation and detection, Time Division Multiplexing.

**UNIT–IV**
**Digital Modulation:** Block diagram of Digital communication system, Advantages of Digital Communication Systems, PCM Generation and Reconstruction, Quantization, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM

**UNIT-V**
**Digital Carrier Modulation Schemes:** ASK, FSK, PSK –Modulator and detector, Comparison of digital carrier modulation schemes, M-ary Signaling Schemes, QAM.
**Baseband Transmission**: Signal Receiver, Probability of error-ASK, FSK, PSK, Optimum Receiver, Coherent reception, ISI, Eye Diagrams

**Text Books:**
1. Simon Haykin, Introduction to Analog & Digital Communications, Second edition, Wiley Publications, 2014
2. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley Publications, 2007

**Reference Books:**
1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.

2. B.P.Lathi, Modern Digital and Analog Communication Systems, 4/e, Oxford University Press, 2017.
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO2: Problem analysis | 2.1 | 2.1.2 |
| CO2 | PO2: Problem analysis | 2.1 | 2.1.2 |
| CO3 | **PO1: Engineering knowledge** | 1.4 | 1.4.1 |
| CO4 | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| CO5 | PO3: Design/Development of Solutions | 3.4 | 3.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0413 | INTEGRATED CIRCUITS AND APPLICATIONS | 3 | 0 | 0 | 3 |

**Course Outcomes**:
CO1: Understand the basic building blocks of linear integrated circuits and its characteristics.
CO2: Ability to understand feedback amplifiers and analyze its frequency response.
CO3: Analyze the linear and non-linear applications of operational amplifiers.
CO4: Realize the importance of specialized applications of Operational Amplifier.
CO5: Understand the different types of Analog to Digital Converters and Digital to Analog Converters.

**UNIT – I**
**DIFFERENTIAL AMPLIFIERS**: Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.
**OPERATIONAL AMPLIFIERS**: Introduction, Block diagram, Ideal op-amp, Equivalent Circuit, Voltage Transfer curve, open loop op-amp configurations. Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

**UNIT-II**
**FEED BACK AMPLIFIERS :**
Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.
**FREQUENCY RESPONSE**: Introduction, compensating networks, frequency response of internally compensated op-amps and non compensated op-amps, High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, slew rate.

**UNIT-III**
**OP-AMP APPLICATIONS-1**
DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First and Second order Butterworth filter and its frequency response.

**UNIT-IV**
**OP-AMP APPLICATIONS -2**
Oscillators, Phase shift and wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.
**SPECIALIZED APPLICATIONS**: 555 timer IC (monostable & astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and phase detection.

**UNIT V**
**A/D AND D/A CONVERTERS**
Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion – Over-sampling A/D Converters,

**TEXT BOOKS**:
1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, 2nd

Edition, 2003.
2. K. LalKishore,"Operational Amplifiers and Linear Integrated Circuits", Pearson Education,2007.

**REFERENCES:**

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 4th edition, 1987.
2. R.F.Coughlin& Fredrick Driscoll, "Operational Amplifiers & Linear Integrated Circuits", 6th Edition, PHI.
3. David A. Bell, "Operational Amplifiers & Linear ICs", Oxford University Press, 2nd edition, 2010.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Engineering knowledge | 1.1 | 1.3.1 |
| CO: 2 | PO 1: Engineering knowledge | 1.1 | 1.3.1 |
| CO: 3 | PO 3: Design/Development of Solutions | 3.2 | 3.2.3 |
| CO: 4 | PO 3: Design/Development of Solutions | 3.2 | 3.2.3 |
| CO: 5 | PO 3: Design/Development of Solutions | 3.2 | 3.2.3 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APE0401 | INFORMATION THEORY AND CODING | 3 | 0 | 0 | 3 |

**Course Outcomes (COs): At the end of the course, students will be able to**
**CO1**. Understand the principles behind modeling data and develop data compression algorithms
**CO2**. Analyze and design data compression algorithms for text, speech and image and multimedia
**CO3.** Understand the need for channel coding and design efficient channel coders
**CO4.** Understand multimedia coding techniques.
**CO5.** Recognize error control coding and decoding procedures.

**UNIT I:**
**INFORMATION ENTROPY FUNDAMENTALS**
Uncertainty - Information and Entropy - Source coding Theorem - Shannon Fano coding – Huffmancoding: static and dynamic - Discrete Memory less channels - Channel coding Theorem –Channelcapacity - Channel capacity Theorem.

**UNIT II :**
**DATA AND VOICE CODING**
Differential Pulse code Modulation - Adaptive Differential Pulse Code Modulation – Delta Modulation - Adaptive Delta Modulation - Adaptive subband coding - Coding of speech signal at low bit rates - Linear Predictive Coding.

**UNIT III :**
**IMAGE CODING**
Image Compression - Types: spatial, transform based - Bit plane coding - DCT, Walsh, and Hadamard Transforms for compression - Graphics Interchange format - Tagged Image File Format -Digitized Pictures - JPEG standards.

**UNIT IV :**
**MULTIMEDIA CODING**
Perceptual coding - MPEG audio coders - Dolby audio coders - Video compression - Principles - H.261 and MPEG Video.

**UNIT V :**
**ERROR CONTROL CODING**
Linear Block codes - Syndrome Decoding- Minimum distance consideration - Cyclic codes - Generator Polynomial - Parity check polynomial - Encoder for cyclic codes - Calculation of syndrome- Convolutional Coding - Decoding using Viterbi Algorithm

**TEXT BOOKS**:
1. Simon Haykin, Communication Systems, John Wiley and Sons, 4th Edition, 2014.
2. Fred Halsall, Multimedia Communications, Applications Networks Protocols and Standards, Pearson Education, 2012.

**REFERENCE(S):**
1. Mark Nelson, Data Compression Book, BPB Publication, 2010.
2. Rafael C.Gonzalez and Richard E.Woods, Digital image processing, PHI, 2013.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1:Engineering knowledge | 1.4 | 1.4.1 |
| CO2 | PO4:Conduct investigations of complex problems | 4.2 | 4.2.2 |
| CO3 | PO3: Design/Development of Solutions | 3.1 | 3.1.6 |
| CO4 | PO3: Design/Development of Solutions | 3.1 | 3.1.6 |
| CO5 | PO2:Problem analysis | 2.2 | 2.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B.Tech III Year I Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APE0402 | MATLAB PROGRAMMING | 3 | 0 | 0 | 3 |

**Course Outcomes (COs): Student can able to do**

CO 1: Understand the MATLAB Desktop, Command and Graph Windows
CO 2: Calculate simple and complex problems using MATLAB
CO 3: Compute Elementary and User defined mathematical functions
CO 4: Perform arithmetic & logical operations and create Plotting
CO 5: Find solutions for various Linear Algebraic equations

**UNIT-I: Introduction to MATLAB**

MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB.

**UNIT-II: Arrays**

Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

**UNIT-III: Functions & Files**

Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

**UNIT-IV: Programming Techniques**

Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging Mat Lab Programs.
Plotting :XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

**UNIT-V: Linear Algebraic Equations**

Elementary Solution Methods, Matrix Methods for (Linear Equations), Cramer‟s Method, Undetermined Systems, Order Systems.

**TEXT BOOKS:**

1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, Numerical Linear Algebra and Applications, Brooks/Cole, 1994 (out of print) 3. L. Elden, Matrix Methods in Data Mining and Pattern Recognition, SIAM Press, 2007

**REFERENCES:**

1. NA-digest, http://www.netlib.org/na-digest-html
2. Societyfor Industrial and Applied Mathematics(SIAM), see http://www.siam.org
3. Google “MATLAB Primer” or “MATLAB Tutorial” and you should be able to access lots of free MATLAB.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering knowledge | 1.4 | 1.4.1 |
| CO2 | PO4: Conduct investigations of complex problems | 4.3 | 4.3.1,4.3.3 |
| CO3 | PO5: Modern tool usage | 5.2 | 5.2.1 |
| CO4 | PO3: Design/Development of Solutions | 3.2 | 3.2.1 |
| CO5 | PO3: Design/Development of Solutions | 3.2 | 3.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APE0403 | COMPUTER SYSTEM ARCHITECTURE | 3 | 0 | 0 | 3 |

**Course Outcomes:**

CO1. Students should be able to understand instructions and addressing modes of a computer system.
CO2. Students should be able to Design arithmetic and logic unit.
CO3. Students should be able to Design and analysis pipelined control units.
CO4. Students should be able to Understand parallel processing architectures.
CO5. Students should be able to Evaluate performance of memory systems

**UNIT I: OVERVIEW & INSTRUCTIONS:**

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing modes

**UNIT II: ARITHMETIC OPERATIONS:**

ALU - Addition and subtraction – Multiplication – division (Fixed point and floating point); Conversion between integer and real numbers; The generation of higher order functions from square roots to transcendental functions; Representation of non-numeric data (character codes, graphical data)

**UNIT III: PROCESSOR AND CONTROL UNIT:**

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

**UNIT IV: PARALLELISM:**

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

**UNIT V: MEMORY AND I/O SYSTEMS:**

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

**Textbooks:**

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw-Hill Inc, 2012.

**References:**

1. William Stallings "Computer Organization and Architecture" , Seventh Edition , Pearson Education, 2006.
2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
**4.** John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Engineering knowledge | 1.4 | 1.4.1 |
| CO: 2 | PO 3: Design/Development of Solutions | 3.4 | 3.4.2 |
| CO: 3 | PO 3: Design/Development of Solutions | 3.4 | 3.4.2 |
| CO: 4 | PO 1: Engineering knowledge | 1.4 | 1.4.1 |
| CO: 5 | PO 2: Problem analysis: | 2.4 | 2.4.2 |

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**B. Tech III Year I Semester**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19AOE0501 | DATABASE MANAGEMENT SYSTEMS | 3 | 0 | 0 | 3 |

**Course Outcomes (CO):**

After completion of the course, students will be able to

- Design a database for a real-world information system
- Define transactions that preserve the integrity of the database
- Generate tables for a database
- Organize the data to prevent redundancy
- Pose queries to retrieve the information from the database.

**UNIT - I Introduction, Introduction to Relational Model** 9Hrs

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators, Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

**UNIT - II Introduction to SQL, Advanced SQL 9 Hrs**

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL: Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

**UNIT - III Database Design and the E-R Model, Relational Database Design 8Hrs**

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

**UNIT - IV Query Processing, Query optimization 8 Hrs**

Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.

Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

**UNIT - V Transaction Management, Recovery System, Indexing and Hashing 10Hrs**

Transaction Management: Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, Multiple-Key Access

Static Hashing, Dynamic Hashing, Bitmap Indices, Index Definition in SQL

**Textbooks:**

1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019

**Reference Books:**

1. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH

**Online Learning Resources:**
https://onlinecourses.nptel.ac.in/noc21_cs04/preview

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AOE0502 | **OPERATING SYSTEMS** | **3** | **0** | **0** | **3** |

**Course Objectives:**

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications.

**Course Outcomes:**

- Able to use operating systems effectively.
- Write System and application programs to exploit operating system functionality.
- Add functionality to the exiting operating systems
- Design new operating systems

**UNIT I**

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

Processes: Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

**UNIT II**

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

Process Synchronization: The critical-section problem, Peterson‘s Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

**UNIT III**

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Virtual memory: demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

**UNIT IV**

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

File system Interface: The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.

File system Implementation: File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

**UNIT V**

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.

Protection: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation

of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection

Security: The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

**Text Books:**

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley , Eight Edition, 2014.

**Reference Books:**

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
4. Operating Systems, A.S.Godbole, Second Edition, TMH.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI (AUTONOMOUS)**

**Year: III** **Semester: I** **Branch of Study: ECE**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AOE0202 | PROGRAMMABLE LOGIC CONTROLLERS | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES**

1. Understand the purpose, functions, and operations of a PLC and Identify the basic components of the PLC and how they function
2. View a directory of processor files using PLC software and Ability to gain knowledge on Programmable Logic Controllers
3. Will understand different types of Devices to which PLC input and output modules are Connected and To provide the knowledge about understand various types of PLC registers
4. Able to create ladder diagrams from process control descriptions
5. Ability to apply PLC timers and counters for the control of industrial processes. Able to use different types PLC functions, Data Handling Function

**UNIT - I**

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

**UNIT - II**

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

**UNIT - III**

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

**UNIT - IV**

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

**UNIT - V**

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

**Text Books:**

1. "John W Webb and Ronald A Reiss", Programmable Logic Controllers – Principle and Applications, PHI, 5th Edition 2003.
2. "JR Hackworth and F. D Hackworth Jr", Programmable Logic Controllers – Programming Method and Applications by - Pearson, 2004

**Reference Books:**

1. "W. Bolton", Programmable Logic Controllers, Newnes, 4th Edition 2000.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| CO3 | PO2: Problem analysis | 2.4 | 2.4.1 |
| CO4 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| CO5 | PO1: Engineering knowledge | 1.3 | 1.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI**
**(Autonomous)**
**AK 19 Regulations**

**B.Tech- III Year** **Semester: I** **Branch: EEE,ECE,CE,ME**

| Subject Code | Subject Name | L | T | P | Credits: 0 |
|---|---|---|---|---|---|
| 19AMC9902 | CONSTITUTION OF INDIA | 3 | 0 | 0 | |

**Course Outcomes:**
Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the Powers and functions of Governor, President, Judiciary.
5. Discuss the functions of local administration bodies.

**Syllabus**

**Unit:1** **4 hrs**
History of Making of the Indian Constitution - History Drafting Committee, ( Composition & Working)

**Unit:2** **8 hrs**
Philosophy of the Indian Constitution - Preamble Salient Features

**Unit:3** **8hrs**
Contours of Constitutional Rights & Duties - Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

**Unit:4** **8hrs**
Organs of Governance - Parliament – Composition - Qualifications and Disqualifications - Powers and Functions - Executive, President, Governor - Council of Ministers -Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions.

**Unit:5** **8hrs**
Local Administration - District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZillaPachayat - Elected officials and their roles, CEO Zilla Panchayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

**Suggested books for reading:**


1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO 1 | PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice | 6.2. | 6.2.1 |
| CO 2 | PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice | 6.2. | 6.2.1 |
| CO 3 | PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice | 6.2. | 6.2.1 |
| CO 4 | PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice | 6.2. | 6.2.1 |
| CO 5 | PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the Professional Engineering Practice | 6.2 | 6.1.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year I Semester**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APC0414 | DIGITAL ELECTRONICS AND LOGIC DESIGN LAB | 0 | 0 | 2 | 1 |

**Course Outcomes:**
**CO1:** Verify the Basic Logic Gates
**CO2:** Verify the Universal gates
**CO3:** Design combinational logic circuits
**CO4:** Design sequential logic circuits
**CO5:** Design Sequential Circuits

**Minimum of Ten experiments to be conducted**
1. Verification of Basic Logic Gates
2. Realization of basic gates using Universal Gates
3. Half adder and Full Adder
4. Half Subtractor and Full Subtractor
5. Parallel Adder/Subtractor
6. Code Converters
7. Encoder/Decoder
8. Flip-Flops
9. Shift Registers
10. Counters
11. Johnson/Ring Counters
12. Sequence Generator

| CO | PO | CI | PI |
|---|---|---|---|
| CO1 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| CO2 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| CO3 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| CO4 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| CO5 | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |

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| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0415 | ANALOG AND DIGITAL COMMUNICATIONS LABORATORY | 0 | 0 | 2 | 1 |

**Course Outcomes:**

**CO1:** Generate the characteristics of different analog modulation schemes.
**CO2:** Analyze different pulse modulation schemes.
**CO3:** Study the characteristics of Multiplexing.
**CO4:** Ability to design different digital modulation schemes.
**CO5:** Ability to analyze and design digital carrier modulation schemes.

**Minimum of Ten experiments to be conducted (Five from each Part-A&B)**

**ANALOG COMMUNICATIONS (PART – A)**

1. Amplitude Modulation
2. Frequency Modulation
3. Pulse Amplitude Modulation
4. Pulse Width Modulation
5. Pulse Position Modulation
6. Time division multiplexing.

**DIGITAL COMMUNICATIONS (PART – B)**

1. Pulse code modulation.
2. Delta modulation.
3. Amplitude shift keying
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.

**Equipment required for Laboratories:**

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.) 0 – 1000 M Hz.
5. Multimeters
6. Lab Experimental kit for Pulse Code Modulation
7. Required Electronic Components (Active and Passive) which include required ICs
8. Arbitrary Wave form generators/ PNS generators – 2 Nos.

| CO | PO | CI | PI |
|---|---|---|---|
| **CO1** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO2** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO3** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO4** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |
| | PO3: Design/Development of Solutions | 3.3 | 3.3.1 |
| **CO5** | PO1:Engineering knowledge | 1.3 | 1.3.1 |
| | PO2:Problem analysis | 2.3 | 2.3.1 |

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| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0416 | INTEGRATED CIRCUITS AND APPLICATIONS LABORATORY | 0 | 0 | 2 | 1 |

**Minimum of Ten experiments to be conducted**
**All experiments are based upon 741 / TL 082/ASLK Kits.**

1. Study the characteristics of negative feedback amplifier
2. Summing and Subtractor Amplifier
3. Design of an instrumentation amplifier
4. Study the characteristics of regenerative feedback system with extension to design an Astable multi vibrator
5. Study the characteristics of integrator circuit
6. Design of Analog filters – I
7. Design of Analog filters – II
8. DC-DC Converter
9. Design of a function generator
10. Design of a Voltage Controlled Oscillator
11. Design of a Phase Locked Loop (PLL)
12. Design of a low drop out regulator

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: **Engineering knowledge** | 1.4 | 1.4.1 |
| CO: 2 | PO 1: **Engineering knowledge** | 1.4 | 1.4.1 |
| CO: 3 | PO 2: **Problem Analysis** | 2.4 | 2.4.4 |
| CO: 4 | PO 3: **Design/Development of Solutions** | 3.4 | 3.4.2 |
| CO: 5 | PO 2: **Problem Analysis** | 2.3 | 2.3.2 |

# B.Tech
# III Year II Semester

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**
**Common to ECE & EEE**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0417 | MICROPROCESSORS AND MICROCONTROLLERS | 3 | 0 | 0 | 3 |

Course Outcomes:
After completion of this subject the students will be able to:
CO1: Describe the concepts of Intel 8085 series of processors.
CO2: Discuss various Concepts of 8086.
CO3: Demonstrate the concepts of 8086 instruction set.
CO4: Program Discriminate the concepts of MSP430x2x Microcontroller series.
CO5: Summarize different peripherals of MSP430.

UNIT I
Overview of microcomputer systems and their building blocks, Introduction to 8-bit microprocessor (8085) Architecture, Addressing modes, Instruction set, Machine cycles, instruction cycle and timing states.

UNIT II
Introduction-8086 Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

UNIT III
Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives- Macros and Procedures.- Sorting, Multiplication, Division and multi byte arithmetic code conversion. String Manipulation instructions-Simple ALPs.

UNIT-IV
Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, Addressing modes, Instruction set Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT-V:
I/O ports pull up/down resistors concepts, Interrupts, Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability. Timer & Real Time Clock (RTC), timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

*Text Books:*
1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996.
2. Douglas V. Hall, "Microprocessors and interfacing: Programming and hardware", 2nd Edition. Tata McGraw Hill, 1991.

3. “Microprocessor and Microcontrollers”, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1st Edition, 2010
4. “The X86 Microprocessors , Architecture, Programming and Inerfacing” , Lyla B. Das, Pearson Publications, 2010
5. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition, 2008

**References:**

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra- Low_Power_MCU_Training

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 3: Design/Development of Solutions | 3.2 | 3.2.2 |
| CO: 2 | PO 4: Conduct investigations of complex problems | 4.1 | 4.1.1 |
| CO: 3 | PO 5: Modern tool usage | 5.1 | 5.1.2 |
| CO: 4 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| CO: 5 | PO 5: Modern tool usage | 5.2 | 5.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0418 | DIGITAL SIGNAL PROCESSING | 3 | 0 | 0 | 3 |

Course Outcomes (COs): **Student can able to**

**CO1: Interpret, represent and process discrete/digital signals and systems**
**CO2: Understand frequency domain analysis of discrete time signals**
**CO3: Design & analyze various Analog Filters and Digital Filters**
**CO4: Implement and realize various structures IIR and FIR systems**
**CO5: Acquire the basics of multi rate digital signal processing**

UNIT-I

Review of discrete-time signals and systems- Standard discrete time signals, classification of discrete time signals, basic operations on sequences, classification of discrete time systems, DT LTI system, properties of DTLTI system –Time domain analysis of discrete-time signals & systems –natural response, forced response, total response , Frequency domain analysis of discrete-time signals and systems-transfer function.

UNIT-II

**Discrete Fourier Transform:** Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2 FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

UNIT-III

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT-IV

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice – Ladder structure.

UNIT-V

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of band pass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.

2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.

REFERENCES:

1. V. Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.

2. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.

3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3. |
| | | | 4.3.4 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.4 | 2.4.1 |
| | | | 2.4.2 |
| | | | 2.4.3 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO3 | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO4 | PO 2: Problem analysis | 2.1 | 2.1.1 |
| | | | 2.1.3 |
| | | 2.3 | 2.3.1 |
| | | | 2.3.2 |
| CO5 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| | PO 10: Communication | 10.3 | 10.3.1 |
| | | | 10.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B. Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0419 | MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS | 3 | 0 | 0 | 3 |

Course Outcomes:

CO1: Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
CO2: Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and circuits are characterized in terms of their "S"- Parameters.
CO3: Ability to analyze the operation of Microwave tubes like klystron, magnetron, travelling wave tube and to measure the different parameters of microwave test bench setup.
CO4: Ability to understand the Optical sources, detectors and their working principle.
CO5: Ability to analyze the channel impairments like losses and dispersion.

UNIT-I

**MICROWAVE TRANSMISSION LINES:** Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, Characteristic equation and cutoff frequencies, filter characteristics, dominant and degenerate modes, sketches of TE and TM mode fields in the cross-section. Mode characteristics- Phase and Group velocities, wavelengths and impedance relations, Illustrative Problems.
**MICROWAVE SOLID STATE DEVICES**: Introduction, classification, applications, Transfer Electronic Devices, Gunn diode-principles, RWH theory, characteristics, basic modes of operation - Gunn oscillation modes.

UNIT-II

**WAVEGUIDE COMPONENTS AND APPLICATIONS**: Coupling mechanisms- probe, loop, aperture types. Wave guide discontinuities-waveguide Windows, tuning screws and posts, matched loads. Waveguide attenuators-resistive card, rotary vane Attenuators; waveguide phase shifters-dielectric, rotary vane phase shifters. Wave guide multiport junctions and scattering parameters-E plane and H plane Tees, Magic Tee, Directional couplers-2 hole, Bothe hole types, Illustrative Problems.

UNIT-III

**MICROWAVE TUBES:** Limitations and losses of conventional tubes at microwave frequencies. Microwave tubes-O type and M type classifications. O type tubes: 2 cavity klystrons-structure, Reentrant cavities, velocity modulation process and Applegate diagram, bunching process and small signal theory-Expressions for O/P power and efficiency. Reflex Klystrons-structure, Velocity Modulation, Applegate diagram, mathematical theory of bunching, power output, efficiency , oscillating modes and O/P characteristics, Effect of Repeller Voltage on Power O/P, Illustrative Problems.
**MICROWAVE MEASUREMENTS:**
Description of Microwave bench-different blocks and their features, errors and precautions, Measurement of

attenuation, frequency standing wave measurements- measurement of low and high VSWR ,impedance measurements.

## UNIT-IV

**Introduction to Optical Fibers:** Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

## UNIT-V

**Signal Degradation Optical Fibers:** Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination –Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength

## TEXT BOOKS:


1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave principles-Herbert J.Reich,J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS publishers and distributors, New Delhi,2004.
3. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000.
4. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.


## REFERENCES:


1. Foundations for microwave engineering-R.E.Collin, IEEE press, John Wiley, 2nd edition, 2002.
2. Microwave circuits and passive devices-M.L.Sisodia and G.S.Raghuvanshi,Wiley Eastern Ltd.,New age International publishers Ltd., 1995.
3. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
4. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
5. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.


| List of COs | PO no. and keyword | Competency | Performance |
|---|---|---|---|
| CO: 1 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.3 |
| CO: 2 | PO 2: Problem analysis: | 2.4 | 2.4.1 |
| CO: 3 | PO 4: Conduct investigations of complex problems | 4.1 | 4.1.2 |
| CO: 4 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO: 5 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APE0404 | REAL TIME OPERATING SYSTEMS | 3 | 0 | 0 | 3 |

**Course Outcomes:**

Upon successful completion of the course, students will be able to

**CO1.** Introduce real-time embedded systems

**CO2.** Describe the different types of policies.

**CO3.** Demonstrate the Multi-resource Services techniques.

**CO4.** Explain the Embedded System Components.

**CO5.** Explain the embedded system design based on availability and reliability.

**UNIT-1: INTRODUCTION TO REAL-TIME EMBEDDED SYSTEMS**

Brief history of Real Time Systems, A brief history of Embedded Systems. Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Executive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions.

**UNIT II: RTOS POLICIES**

Preemptive Fixed-Priority Policy, Feasibility, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies. I/O Resources: Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture. Memory: Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash file systems.

**UNIT III: MULTI-RESOURCE SERVICES**

Blocking, Deadlock and livestock, Critical sections to protect shared resources, priority inversion. Soft Real-Time Services: Missed Deadlines, QoS, Alternatives to rate monotonic policy, mixed hard and soft real-time services.

**UNIT IV: EMBEDDED SYSTEM COMPONENTS**

Firmware components, RTOS system software mechanisms, Software application components. Debugging Components- Exceptions assert, checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self-test and diagnostics, External test equipment, Application-level debugging. Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations.

**UNIT V: AVAILABILITY AND RELIABILITY DESIGN**

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design tradeoffs, Hierarchical applications for Fail-safe design. Design of RTOS – PIC microcontroller.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO 2: Problem analysis | 2.3 | 2.3.2 |
| CO3 | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| CO4 | PO 3: Design/Development of solutions | 3.2 | 3.2.2 |
| CO5 | PO 3: Design/Development of Solutions | 3.2 | 3.2.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B. Tech III Year II Semester**

| Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|
| 19APE0405 | VLSI DESIGN | 3 | 0 | 0 | 3 |

**Course Outcomes:**
CO1. Identify the various IC fabrication methods and Electrical Properties of MOS circuits
CO2. Design VLSI circuits using design rules
CO3. Design VLSI circuits at Gate level and Physical level.
CO4. Can implement circuit through various design styles and verification using VHDL synthesis.
CO5**.** Understand testing VLSI circuits and need of LPVLSI

**UNIT-I**
**Introduction: Basic steps of IC fabrication**: PMOS, NMOS, CMOS &BiCMOS,and SOI process technologies, MOS transistors - MOS transistor switches – Basic gate using switches, working polar transistor Resistors and Capacitors.
**Basic Electrical Properties of MOS and BiCMOS Circuits:** Working of MOS transistors – threshold voltage; MOS design equations: Ids–Vds relationships, Threshold Voltage, Body effect, Channel length modulation , gm, gds, figure of merit ω0; Pass transistor, NMOS Inverter, CMOS Inverter analysis and design, Various pull ups loads,
Bi-CMOS Inverters.

**UNIT-II**
**Basic Circuit Concepts**: Capacitance, resistance estimations- Sheet Resistance Rs, MOS Device Capacitances, routing Capacitance, Analytic Inverter Delays, Driving large Capacitive Loads, Fan-in and fan-out.
**VLSI Circuit Design Processes**: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

**UNIT-III**
**Gate level Design**: Logic gates and other complex gates, Switch logic, Alternate gate circuits.
**Physical Design**: Floor Planning Methods, Global Interconnect, Floor Plan Design, Off Chip Connections.

UNIT-IV
**VLSI Design styles**: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.
**VHDL Synthesis**: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

**UNIT-V**
**Test and Testability**: Fault-modeling and simulation, test generation, design for testability, Built-in-self-test.
**Introduction to Low Power Design:** Why Low Power? Sources of Power dissipation: Dynamic Power, Static Power, Low Power Design Methodologies.

**TEXT BOOKS:**
1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, “Essentials of VLSIcircuits and systems”, PHI, 2013 Edition.
2. K.Lal Kishore and V.S.V. Prabhakar, “VLSI Design”, IK Publishers

**REFERENCES:**


1. Weste and Eshraghian, “Principles of CMOS VLSI Design”, Pearson Education,1999.
2. Wayne Wolf, “Modern VLSI Design”, Pearson Education, 3rd Edition, 1997.
3. John P. Uyemura, “Chip Design for Submicron VLSI: CMOS layout andSimulation”, Thomson Learning.
4. Fault Tolerant and Fault Testable Hardware Design, Parag K.Lala
5. Low Power VLSI Circuits & Systems, Ajith Paul.


| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | **PO 3:** Design/Development of Solutions | 3.4 | 3.4.2 |
| CO: 2 | **PO 2:** Problem analysis | 2.3 | 2.3.1 |
| CO: 3 | **PO 2:** Problem analysis | 2.4 | 2.4.4 |
| CO: 4 | **PO 4:** Conduct investigations of complex problems | 4.1 | 4.1.3 |
| CO:5 | **PO4:** Conduct investigations of complex problems | 4.1 | 4.1.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APE0406 | MEMS | 3 | 0 | 0 | 3 |

Course Outcomes:

CO1: Able to understand the Micro sensors and different material properties
CO2: Able to understand the micro machine process for different techniques
CO3: Able to understand the types of Microsensors
CO4: Able to understand the MEMS accelerometers functionality and know its applications.
CO5: Able to know where to use MEMS devices and understand CNT

**UNIT I**

**Introduction:** Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

UNIT II

**Microelectronic Technology for MEMS:** Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micro machined Microstructure, Micro stereo lithography,

UNIT III

**Micro Sensors:** MEMS Microsensors, Thermal Microsensors, Mechanical Micromachined Microsensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micro machined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor

UNIT IV

**MEMS Accelerometers:** Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezo resistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

UNIT V

**MEMS Applications:** Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Interface Electronics for MEMS, Introduction to Bio MEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS)

Text Books:

1. Nadim Maluf Kirt Williams “An Introduction to Micro electro mechanical Systems Engineering”, Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V KandVaradan “Microsensors, actuators, MEMS, and electronics for smart structures” Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Micro fabrication, SPIE Optical Engineering Press

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |
| CO: 2 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |
| CO: 3 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |
| CO: 4 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |
| CO: 5 | PO 3: Design/Development of Solutions | 3.4 | 3.4.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**

| **III B.Tech** | **Semester**-II | **Branch : Common to all** |
|---|---|---|

| Subject Code | Subject Name | L T P | Credit: 3 |
|---|---|---|---|
| **19AHE9902** | **Principles of Effective Public Speaking** | 3 0 0 | |

**Course Outcomes:**

**Students will be able to:**

1. Apply knowledge of principles, concepts and skills learned in speech preparation.
2. Develop skills in effective listening.
3. Evaluate the delivery of speeches.
4. Develop skills in speech composition.
5. Use supporting materials and presentation aids in speech preparation.

**Unit -1 Introduction to Public Speaking:**

Basic communication concepts, processes, and models Communication concepts and principles and public speaking Steps and methods of speech preparation; Ethics in public speaking

**Unit -2 Listening and Speech Criticism:**

Effective listening, the listening process, and types of listening; Listening barriers; Identifying and improving listening styles; Evaluating speech and effective speech techniques.

**Unit -3Selecting Topic and Knowing your Audience**:

Identifying sources; Tools and techniques for selecting and refining speech topics; Identifying speech purposes; Central idea statement; The central idea; Audience analysis techniques.

**Unit – 4 Speaking with a Purpose:**

Informative, persuasive, and ceremonial speeches

**Unit:5 Delivering your speech and using Visual Aids.**

The mechanics of verbal and nonverbal communication in speech delivery; Modes of speech delivery; Speaking style and language; Effective delivery techniques; Incorporating presentation aids

**References:**

1. DeVito, J.A. (2009). The Essential Elements of Public Speaking. (3rd ed.) Boston: Pearson Education, Inc.

2. Lucas, S.E. (2009). The Art of Public Speaking. (10th ed.) New York: McGraw - Hill Co.

3. Zarefsky, D. (2011). Public Speaking: Strategies for Success. (6th ed. Boston: Pearson Education, Inc).

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation,<br>make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.2 |
| CO2 | PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation,<br>make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.1 |
| CO3 | PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.. | 9.2 | 9.2.1 |
| CO4 | PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation,<br>make effective presentations, and give and receive clear instructions. | 10.2 | 10.2.2 |
| CO5 | PO10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation,<br>make effective presentations, and give and receive clear instructions. | 10.3 | 10.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**
**(Common to all branches of Engineering)**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AHSMB01 | MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS | 3 | 0 | 0 | 3 |

Course Outcomes:

CO 1:Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.

CO 1:Apply the Concept of Production cost and revenues for effective Business decision

CO 1:Analyze how to invest their capital and maximize returns.

CO 1:Evaluate the capital budgeting techniques.

Define the concepts related to financial accounting and management and able to develop the accounting statements and evaluate the financial performance of business entity.

**UNIT - I Managerial Economics**

Introduction – meaning, nature, meaning, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

**UNIT - II Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

**UNIT - III Business Organizations and Markets**

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

**UNIT - IV Capital Budgeting**

Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

**UNIT - V Financial Accounting and Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

**Textbooks:**


1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019


**Reference Books:**


1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**B.Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AOE0518 | SCRIPTING LANGUAGES | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To introduce client side scripting with JavaScript and HTML
2. To introduce server side programming with Java Servlets, JSP and PHP.
3. To learn the basic web concepts, protocols and frameworks for web development.

**Course Outcomes:**

1. Demonstrate knowledge on web page design elements, dynamic content and database Interaction,
2. Use HTML, JavaScript and PHP technologies for web application development
3. Design client-server applications using Scripting languages.
4. Able to do server side programming with Java Servlets, JSP and PHP.

**UNIT I**

Introduction: Fundamentals of HTML, Working with text, Organizing text in HTML, Working with links and URLS, Creating tables, Working with images, Canvas, Forms, Frames and Multimedia.

HTML5: Introduction, HTML5 Document Structure, Creating editable content, checking spelling mistakes, Exploring custom data attributes, Client-Side storage, Drag and drop feature, offline web application, Web communications, Cross-Document messaging and desktop notifications.

**UNIT II**

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript.

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies.

Installing and Configuring Apache Tomcat Web Server: DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

**UNIT III**

Java Script Advanced concepts : Unicode, strings, symbols, control flow elements, exception handling, callable values, modules-ECMA script module, Dynamic module.

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

**UNIT IV**

Introduction to PHP: The problem with other Technologies (Servlets and JSP), Downloading, installing, configuring PHP, Programming in a Web environment and The anatomy of a PHP Page.

Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.

PHP Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, Authenticating users, Using Environment and Configuration variables, Working with Date and Time.

**UNIT V**

Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, Validating form input, Working with multiple forms, and Preventing Multiple Submissions of a form.

PHP and MYSQL Integration : Interacting with my SQL using PHP,

Using PHP to Create – (i) Online Address book, (ii) Discussion forms, (iii) Online Store, (iv) Shopping cart, (v) Simple Calendar.

**Text Books**


1. Deitel and Deitel and Nieto, "lnternet and World Wide Web - How to Program", Prentice Hall, 5 th Edition, 2011.
2. Sams Teach Yourself PHP & MySQL 5th Edition.
3. Java Script for Impatient Programmers by Dr.Axel Raushmayer.


**Reference Books**


1. Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011.
2. Core Servelets AND Java Server Pages VOLUME 1: CORE TECHNOLOGIES By Marty Hall and Larry Brown Pearson Snig Bahumik, Bootstrap Essentials, PACKT Publishing, 2015.
3. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
4. W. Jason Gilmore, Beginning PHP & MySql, APress, Fourth Edition, 2011.

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**AK19 REGULATIONS**

**Year: III** **Semester: II** **Branch of Study: ECE**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0216 | NEURAL NETWORKS AND FUZZY LOGIC | 3 | 0 | 0 | 3 |

**COURSE OUTCOMES**

CO 1:Understand the basic architecture of artificial neural network terminologies and techniques.
CO 1:Understand approaches and architectures of Artificial Intelligence.
CO 1:Perform the training of neural networks using various learning rules.
CO 1:Create different neural networks of various architectures both feed forward and feed backward.
CO 1:Application of ANN to System Identification and Pattern recognition.

**UNIT – I ARTIFICIAL NEURAL NETWORKS**
Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems. Introduction and motivation: Neural Network, Human Brain, Structure of biological neuron, Memory, Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies, Artificial Intelligence and Neural Networks.

**UNIT – II**
**Learning Process**: Layers, activation functions, learning methods: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Memory, Adaption, Back Propagation and Differentiation, Supervised Learning, unsupervised learning.

**UNIT – III NETWORKS**
Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories - Self-Organization Map – Hopfield models – ART networks.

**UNIT – IV FUZZYLOGIC**
Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

**UNIT – V FUZZY LOGIC APPLICATIONS**
Fuzzy pattern recognition – Fuzzy control system – Aircraft landing control problem - Statistical process control- Fuzzy cognitive mapping – Probability measures – Possibility and necessity measures.

**TEXT BOOKS:**
1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Neural Networks using MATLAB”, McGraw Hill Edition, 2006.
**2.** Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Third Edition, WILEY India Edition, 2012.

**REFERENCES:**

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer International Edition, 2013.
2. Laurene V. Fausett “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”

United States Edition.
3. Yung C. Shin and Chengying Xu, "Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

| CO No. | PO No. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| CO2 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| CO3 | PO2: Problem analysis | 2.4 | 2.4.1 |
| CO4 | PO1: Engineering knowledge | 1.3 | 1.3.1 |
| | | 1.4 | 1.4.1 |
| CO5 | PO1: Engineering knowledge | 1.3 | 1.3.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
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**AK19 REGULATIONS**
**B. Tech III Year II Semester**
**Common to ECE & EEE**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19AHE9907 | **ADVANCED OPTICS** | **3** | **0** | **0** | Credits:3 |

**Course Outcomes**

1. Analyze the wave properties of light.
2. Interpret the interaction of energy with matter.
3. Analyze the semiconductor photo devices.
4. Interpret structural spectroscopic techniques.
5. Analyze NMR and ESR spectra.

**UNIT I Polarization** **10 Hours**

Polarization-Experimental observation-Polarization by reflection and refraction-Brewster angle-Pile of plates-Biot's polariscope- Malus laws, Double refraction - Optic axis, Uniaxial and biaxial crystals, Geometry of calcite crystals, Nicol prism, Nicol as analyzer and polarizer. Huygen's explanation of double refraction, Quarter wave and Half wave plates, Production and detection of plane, elliptical and circular polarization of light

**UNIT II Semiconductor Optics** **12 Hours**

Semiconductor light emitting diodes (LEDs)- Radiative and non-radiative recombination mechanisms in semiconductors-LED: device structure, materials and characteristics,- Review of laser physics-Rate equations for carrier- and photon-density, and their steady state solutions-Semiconductor laser: structure, materials, device characteristics, and figures of merit; DFB, DBR, and vertical-cavity surface-emitting lasers (VECSEL)-Tunable semiconductor lasers.

**UNIT III Photo devices and their instrumentation** **8 Hours**

Photodetectors -Types of semiconductor photodetectors -p-n junction, PIN, and Avalanche --- and their structure, materials, working principle and characteristics-Noise limits on performance- Solar cells. Low-dimensional optoelectronic devices -Quantum-well, -wire, and -dot based LEDs, lasers, and photodetectors.

**UNIT IV Spectroscopic Techniques-I** **9 Hours**

UV-visible Spectroscopy: principles- instrumentation- quantitative analysis by absorption measurements-simultaneous determinations- applications.

Raman Spectroscopy**:**Quantum theory of Raman effect –degree of depolarisation–FT Raman spectrometer-Instrumentation and sampling methods– construction of character table – calculation of normal modes of vibration - Raman and I.R activity.

**UNIT V Spectroscopic Techniques-II** **11 Hours**

NMR Spectroscopy **:** Theory of NMR method – Bloch equations- Steady state solution of Bloch equations-Theory of chemical shifts- Experimental methods –Single coil and double coil methods –Pulse method –High resolution method –Application of NMR to quantitative measurements. ESR Spectroscopy: Quantum mechanical treatment of ESR- hyperfine structure-Basic principles of spectrographs-Application of ESR method.

**Textbooks:**


1. Optics by Ajay Ghotak.
2. A textbook of Optics by Brij Lal and Dr. M. Subhramanyam.
3. Optics by Dr. S. P. Singh and Dr. A.P. Agarwal.


**References:**


1. Fundamental of Optics by F.A. Jenkins and H. E. White.
2. The Feynman Lecture of Physics by Richard Feynman.
3. Optics by Eugene Hecht.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO1 : Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 2 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 3 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 4 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |
| CO: 5 | PO1: Apply the knowledge of science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES: TIRUPATI**
**(AUTONOMOUS)**

**III.B.Tech** **AK19 Regulations**

**Humanities Elective Course (ECE)**

| Subject Code | Subject Name | L | T | P | Credits:3 |
|---|---|---|---|---|---|
| **19AHE9905** | MATERIALS CHEMISTRY | **3** | **0** | **0** | |

**Course Outcomes**

CO-1. Student should be able to understand the grain boundaries, properties, grain size measurement and types of solid solutions.
CO-2. Student should be able to understand in detail about one component and binary component system.
CO-3. Ability to know about composite materials, preparation of metal powders.
CO-4. Ability to understand Chemical analysis and different types of spectroscopic techniques.
CO-5. Student should be able to understand in detail about material structure, crystal defects and constitution of alloys.

## Unit- I: Introduction To Materials Science

**Structure of metals:** Bonds in Solids, Crystallization of metals, Grain and grain boundaries, Effect of grains and boundaries on the properties of metals / alloys, Determination of grain size measurement.

**Constitution of alloys:** Necessity of alloying, Types of solid solutions, Humerothery rules, Intermediate alloy phases.

## Unit II: Multiphase Materials

Introduction to interstitial and substitutional solid solutions, complex solid solutions intermetallic compounds, condensed phase rule, one component system Si and Fe. Binary isomorphous system: Cu-Ni, Au-Cu,Liver Rule, Fe-Ni, Fe-C phase diagrams, phase transformation in Fe-C alloys, Ferrous and non-ferrous alloys.

## Unit – III: Powder Metallurgy and Composite Materials

Methods of production of metal powders, Atomization process, Electrolysis, Reduction, Mechanical Alloying, Mixing, Blending, Compacting, Hot and Cold Isostatic pressing, Sintering, Applications, Advantages and limitations of powder metallurgy; Composite materials – types of matrices and reinforcement, polymer matrix composites, metal matrix composites.

## Unit – IV: Characterization of Materials

Introduction, Steps in metallographic specimen preparation, Optical Microscopy, Elements of Image Analysis and Quantitative Metallography, X-Ray Diffraction, Intensity of diffracted beam, Scanning Electron Microscopy, Modes of Operation, Fractography, Chemical Analysis using Energy Dispersive Analysis – Transmission Electron Microscopy Principles.

## Unit V: Crystal structures and imperfections in crystals

Materials Structure: Space lattice, Unit cells and Metallic crystal structures (SC, BCC, FCC and HCP), Crystal defects: Point, Line, Interstitial and Volume, Primary and secondary bonding in materials. Constitution of Alloys: Necessity of Alloying, Gibb's phase.

**References:**


1. Callister W.D., “Material Science and Engineering- An Introduction”, 9th Edition, Wiley Eastern, 2013.
2. V.D. Kodgire and S.V. Kodgire, “Material Science and Metallurgy for Engineers”, 41st Edition, Everest Publishing House, 2017.
3. George E. Dieter, “Mechanical Metallurgy”, McGraw Hill, 1988
4. V. Raghavan, “Materials Science and Engineering”, 5th Edition, PHI, 2005.
5. Matthew J. Donachie, “Super Alloys: A Technical Guide”, 2nd Edition, 2002.

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 2 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 3 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 4 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |
| CO: 5 | PO 1: Apply the knowledge of basic science | 1.2 | 1.2.1 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::TIRUPATI**
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**Year: II** **Semester: I** **Branch of Study: Common to all**

| | | | | | |
|---|---|---|---|---|---|
| **19AMC9904** | **PROFESSIONAL ETHICS AND HUMAN VALUES** | **L 3** | **T 0** | **P 0** | **Credits: 0** |

**Course Objective:**

To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

**UNIT - I:**

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

**UNIT - II:**

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect ( Samman) as the foundational values of relationship. Understanding the harmony in the society ( society being an extension of family). Visualizing a universal harmonious order in society - Undivided Society ( Akhand Samaj), Universal Order ( Sarvabhaum Vyawastha) - from family to world family!

**UNIT – III:**

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

**UNIT – IV:**

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

**UNIT – V:**

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

**TEXT BOOKS:**

1.R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

**REFERENCE BOOKS:**

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

2.Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins, 4e , Cengage learning, 2015.

4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

**Course Outcome:**

1. It ensures students sustained happiness through identifying the essentials of human values and skills.
2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.
3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.
4. Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.

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**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**
**Common to ECE & EEE**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0420 | MICROPROCESSORS AND MICROCONTROLLERS LABORATORY | 0 | 0 | 2 | 1 |

Course Outcomes:
After completion of this subject the students will be able to :
CO1: To apply the assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.
CO2: To demonstrate the steps in executing an assembly language program using an assembler.
CO3: Understand concepts of MSP 430 Controllers
CO4: Program MSP 430 for designing any basic Embedded System
CO5: Design and implement some specific real time applications Using MSP 430 low power microcontroller.

**Minimum of Ten experiments to be conducted (Five from each Part-A&B)**
**Part A: 8086 Microprocessor Programs using MASM/8086 microprocessor kit.**
1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using ASCII arithmetic operations
4. Programs for code conversion
5. Sorting of the given numbers
6. String operations

Part B: Embedded C Experiments using MSP430 Microcontroller
1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs, push buttons)
2. Usage of Low Power Modes: (Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. Interfacing potentiometer with MSP430
5. Using ULP advisor in Code Composer Studio on MSP430
6. Low Power modes and Energy trace++:

Note: Any six experiment from Part A and Six experiments from Part B are to be conducted

| List of COs | PO no. and keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO: 1 | PO 3: Design/Development of Solutions: | 3.3 | 3.3.1 |
| CO: 2 | PO 4: Conduct investigations of complex problems: | 3.3 | 3.3.2 |
| CO: 3 | PO 5: Modern tool usage: | 5.1 | 5.1.2 |
| CO: 4 | PO 5: Modern tool usage: | 5.2 | 5.2.1 |
| CO: 5 | PO 5: Modern tool usage: | 5.3 | 5.3.2 |

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)-AK19 REGULATIONS**
**B. Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0421 | DIGITAL SIGNAL PROCESSING LABORATORY | 0 | 0 | 2 | 1 |

**Course Outcomes (COs): Student can able to**
**CO1: Generate various standard discrete time signals /sequences.**
**CO2: Perform basic operations on discrete time signals**
**CO3: Compute Fourier Transform of discrete time/digital signal**
**CO4: Design & analyze various Butterworth & Chebyshev Analog Filters**
**CO5: Design & analyze various IIR & FIR Digital Filters**

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)
Software Experiments (PART – A)

1. Finding Power and (or) Energy of a given signal.
2. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
3. DTFT of a given signal
4. N – point FFT algorithm
5. Design of analog filters.
6. Design of FIR & IIR filter and verify the frequency response of the filter.

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS) (PART – B)

1. Finding Power and (or) Energy of a given signal.
2. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
3. DTFT of a given signal
4. N – point FFT algorithm
5. Design of analog filters.
6. Design of FIR & IIR filter and verify the frequency response of the filter.

Equipment/Software Required:

1. Licensed MATLAB software with required tool boxes for 30 users.
2. DSP floating Processor Kits with Code Composure Studio (8 nos.)
3. Function generators
4. CROs
5. Regulated Power Supplies.

| CO No. | PO No. and Keyword | Competency Indicator | Performance Indicator |
|---|---|---|---|
| CO1 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| | | | 4.3.2 |
| | | | 4.3.3. |
| | | | 4.3.4 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO2 | PO 1: Engineering knowledge | 1.3 | 1.3.1 |
| | PO 2: Problem analysis | 2.4 | 2.4.1 |
| | | | 2.4.2 |
| | | | 2.4.3 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO3 | PO 2: Problem analysis | 2.4 | 2.4.1 |
| | | | 2.4.2 |
| | PO 5: Modern tool usage | 5.2 | 5.2.1 |
| | | | 5.2.2 |
| CO4 | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |
| CO5 | PO 3: Design/Development of solutions | 3.3 | 3.3.1 |
| | | | 3.3.2 |

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**B. Tech III Year II Semester**

| COURSE CODE | COURSE TITLE | L | T | P | CREDITS |
|---|---|---|---|---|---|
| 19APC0422 | MICROWAVE ENGINEERING & OPTICAL COMMUNICATIONS LABORATORY | 0 | 0 | 2 | 1 |

**Course Outcomes:**

CO1: Capable of Applying microwave Concepts/ Microwave components and test them .
CO2: Able to analyze Microwave Active Devices by conducting experiments and measuring various parameters.
CO3: Able to analyze antenna performance by conducting experiments and measuring various parameters.
CO4: Able to design and analyse an optical fiber communications link.
CO5: Able to analyze the characteristics of Optical Sources and Optical fiber by conducting experiments and measuring various parameters.

Microwave Lab (PART – A) --- Any Six (6) Experiments

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Frequency and Wavelength measurements using slotted section.
7. Radiation Pattern Measurement of any two Antennas.

Optical Fiber Lab (PART – B) --- Any four (4) Experiments

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Measurement of Numerical Aperture of the given fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply 6 nos.
2. VSWR Meter 6 nos.
3. Milli/Micro Ammeters 10 nos.
4. Multi meters 10 nos.
5. CROs 8 nos.
6. GUNN Power Supply, Pin Moderator4 nos.
7. Relevant Microwave components--
8. Fiber Optic Analog Trainer based LED3 nos.
9. Fiber Optic Analog Trainer based laser2nos.
10. Fiber Optic Digital Trainer 1 no.
11. Fiber cables - (Plastic, Glass)

| List of | PO no. and keyword | Competency | Performance |
|---|---|---|---|
| CO: 1 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.1 |
| CO: 2 | PO 4: Conduct investigations of complex problems | 4.1 | 4.1.2 |
| CO: 3 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.3 |
| CO: 4 | PO 4: Conduct investigations of complex problems | 4.2 | 4.2.1 |
| CO: 5 | PO 4: Conduct investigations of complex problems | 4.3 | 4.3.3 |